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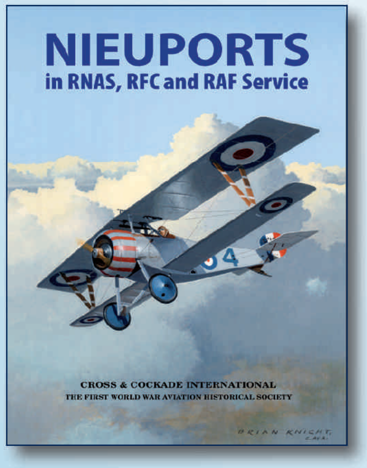
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IN THE SPACE OF JUST OVER TEN YEARS, from the first heavier than air powered flight by the Wright Brothers, the aircraft found itself entering into the war to end all wars. There is little wonder, considering how new the concept of powered aircraft was, that the flying-machine as a military weapon was not taken particularly seriously by commanders outside of aviation in August 1914.

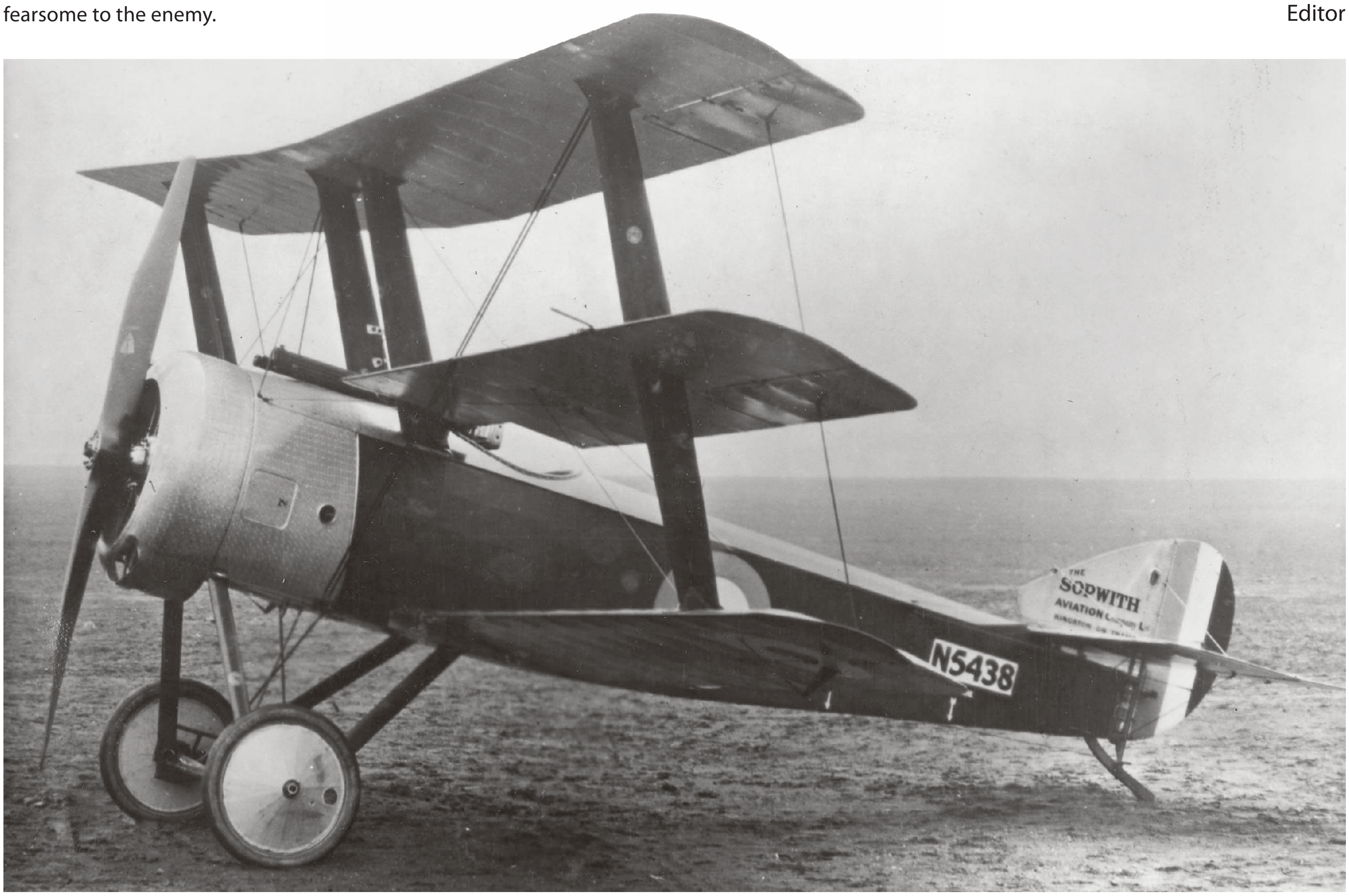
During the early stages of the conflict the usefulness of the aircraft was recognised as a reconnaissance machine and artillery spotter, both of which were particularly dangerous roles. At the beginning air forces on all sides were small with machines being counted in the tens and low hundreds, but by 1918 all could call upon thousands of aircraft capable of performing a variety of roles.

The pressure of being at war accelerated the pace of development dramatically, engines more than doubled in horsepower, structures doubled in strength and weapons either increased in calibre or were more effectively employed. Bomb loads rose from a few pounds to thousands of pounds while overall performance and manoeuvrability evolved to produce fighting machines that were more challenging and fearsome to the enemy.

Production of these early aircraft introduced a huge range of new manufacturers, some of whom would become well known pioneers of aviation development in their own right after the war. The relative simplicity of aircraft during this period meant that large amounts of unskilled and semi-skilled labour could be employed by companies, who in peacetime, were more likely to have plied their trade by selling furniture, musical instruments or components for the motoring industry. Little training was needed and generally a single pattern aircraft was supplied to each sub-contractor, who re-drew a set of plans and then set about building the required number to meet the contract.

This issue in the Aeroplane Collector's Archive series covers a wide range of aeroplanes, which reflect how rapidly the development of the fighting aircraft progressed from 1914 to 1918.The broad range selected here include many iconic machines such as the Avro 504, Fokker Eindecker, Sopwith Triplane, Sopwith Camel, Fokker Dr.1 Triplane and RAF SE.5A and some lesser known types built by Caproni, Morane-Saulnier, Voisin and Pfalz.

Martyn Chorlton,
Editor



Only built in small numbers the Sopwith Triplane was one of the most influential fighters to appear during the First World War. The small fighter dominated the air during early 1917 to such an extent the Germans became obsessed with replicating the triplane and as a result the Fokker Dr.I Triplane appeared a few months later.

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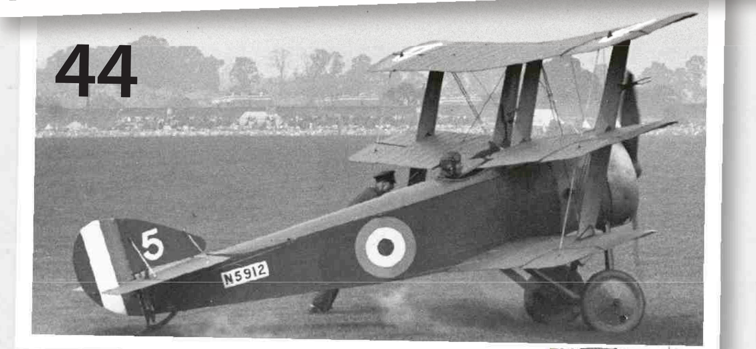

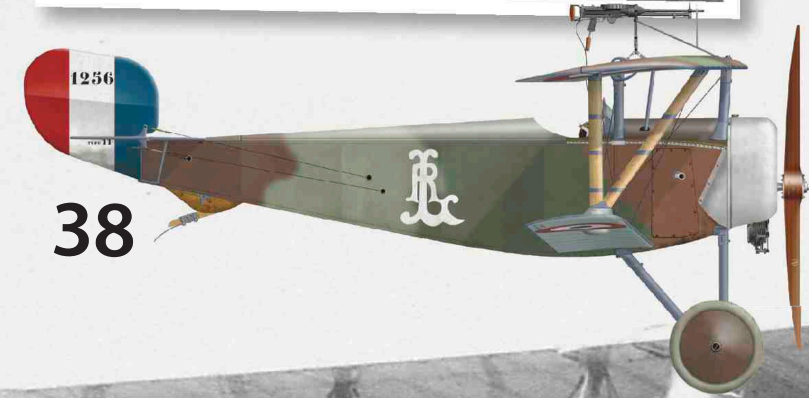

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The development of aerial warfare and the fighting aeroplane during the First World War

Ancillary weapons

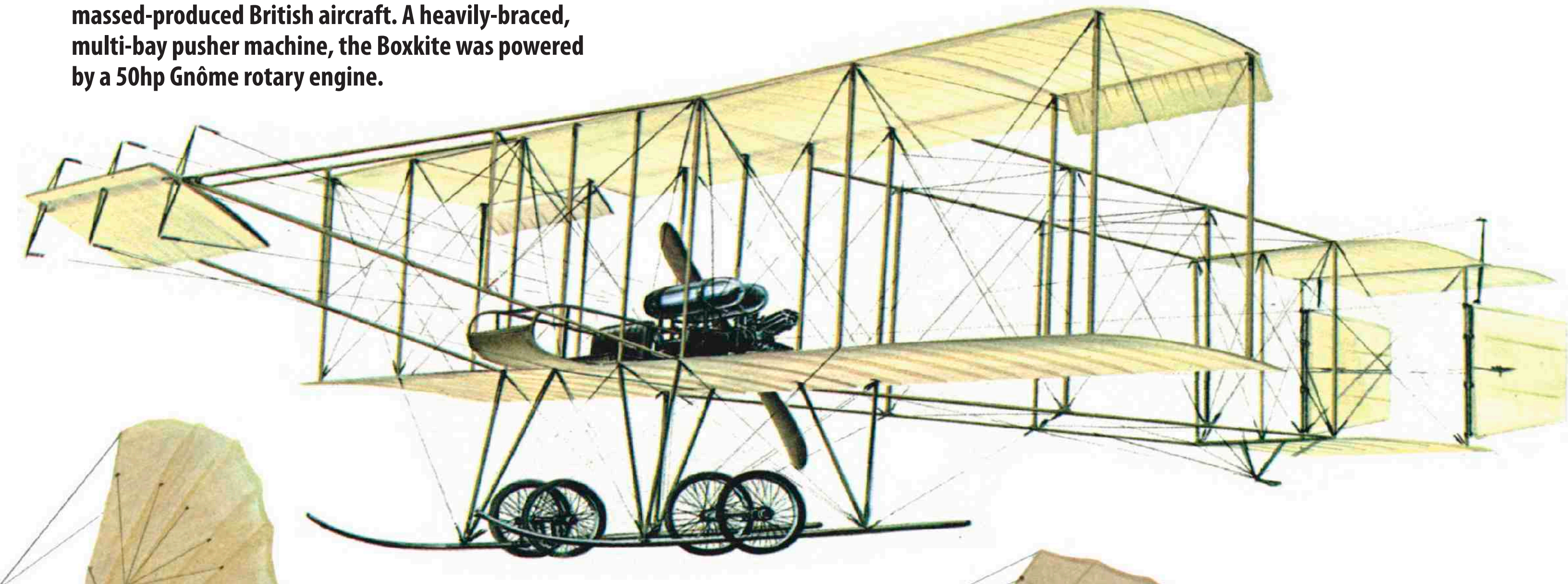
At the beginning of the First World War, military aircraft, with the odd exception, were viewed by the world's armies and navies as little more than ancillary weapons. This remained the case in Britain until the formation of the Royal Air Force (RAF) in April 1918. Prior to this, aircraft were either tasked with naval support operations or army co-operation and even at the very end of the First World War, these types of 'support' sorties were being flown at a rate of approximately 19 to 1 (the '1' representing a operation actually tasked by the RAF). So, understandably, the armies and navies across the globe viewed aviation in nothing more than a support role and this would remain the attitude long into the inter-war period.

Prior to the first sustained powered flight by a heavier than air aircraft in 1903, the military had been experimenting with balloons. A long time had already passed since Jean-François Pilâtre de Rozier and François Laurent le Vieux d'Arlandes carried out the first manned free balloon flight on November 21, 1783 in a Montgolfier balloon. In France, the potential of the balloon for aerial observation was recognised and the French Aerostatic Corps was formed to operate one example during the Battle of Fleurus in 1794. Another balloon was successfully employed during the Siege of Mainz but Napoleon disbanded the corps in 1799.

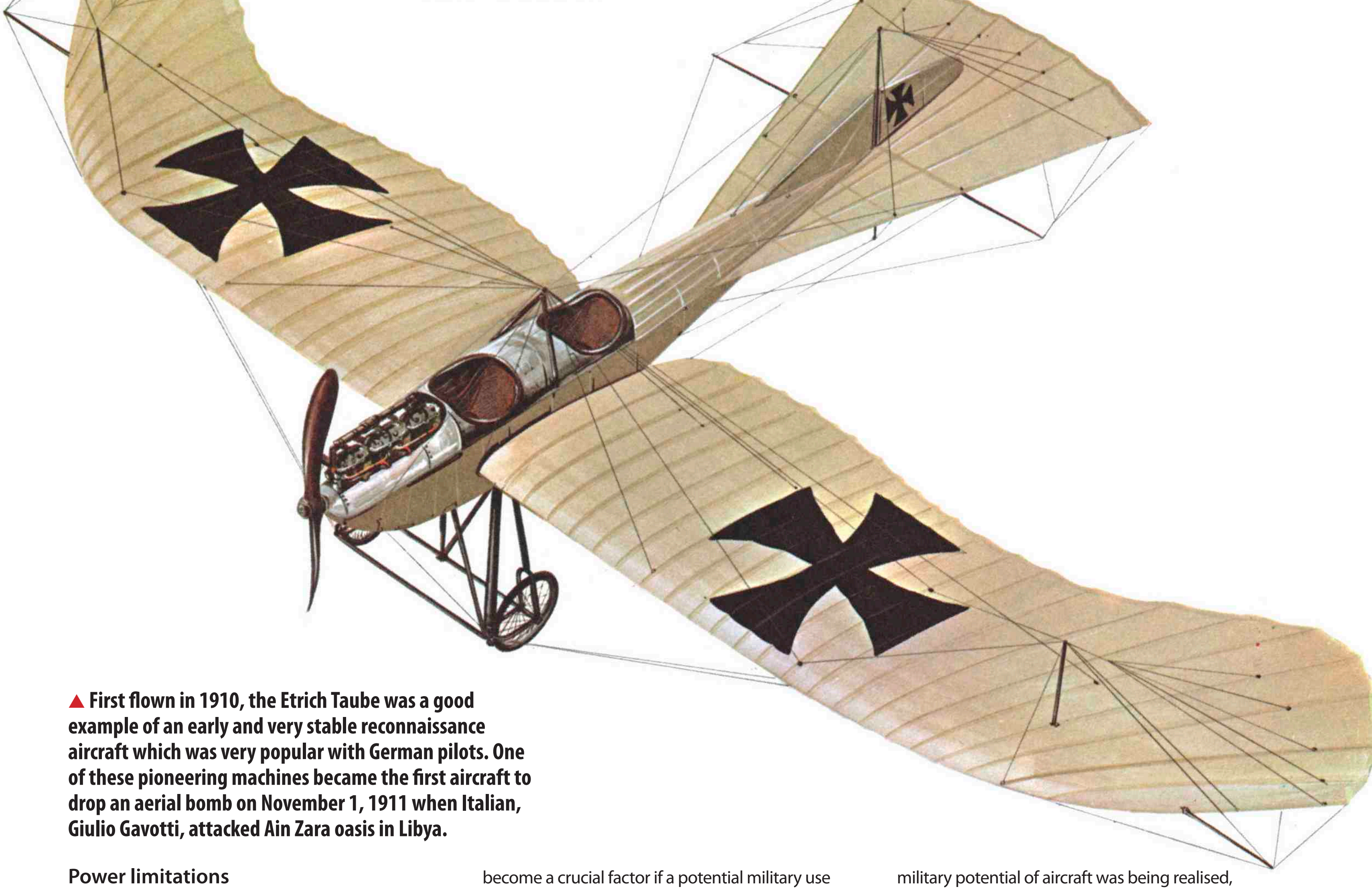
Balloons continued to have their uses during the 19th Century. Once again in France, several were used during the Siege of Paris in 1870, carrying messages and people in and out of the city. However, like Napoleon before them, military leaders saw no potential in 'flying machines', even when the first dirigibles began to arrive in the shape of the Charles Renard and Arthur Krebs' machine named La France.

It was the Italians who were the first to fully embrace the concept of military aviation when they formed an Army Aeronautical Section in 1884. This unit operated several balloons for reconnaissance duties during the Eritrean War between 1887 and 1888. Italy was also the first to use aviation in conjunction with the army during manoeuvres in Libya during 1911; five aircraft and two small airships took part in the successful exercise. Later in the year, on October 23, war broke out between Italy and Turkey. The conflict gave the 'Commander of the Air Fleet' of the Royal Italian Army air detachment, Capt Piazza, the opportunity to carry out the world's first 'wartime' flight. Apparently the Turkish troops were unsurprisingly perplexed about the idea of a metal bird being operated by the enemy looking down onto their positions and even more concerned when bombs began to fall on November 1. Lt Cavotti in an Etrich Taube (Dove) dropped four bombs which were Swedish-made 4.4lb modified grenades on enemy targets, a tactic which continued throughout the remainder of the war that ended in October 1912. The two airships that were involved in the conflict were also used to good effect, a method of attack that would be embraced during the forthcoming First World War with terrifying effect.

The Dutch aviation pioneer Anton Herman Gerard 'Anthony' Fokker pictured in front of one of his creations, the Fokker Eindecker. Not a great aircraft in its own right, the secret of the machine's success was the capability of the machine-gun to fire directly through the blades of the propeller, enabling the pilot to literally point the Eindecker at the enemy.



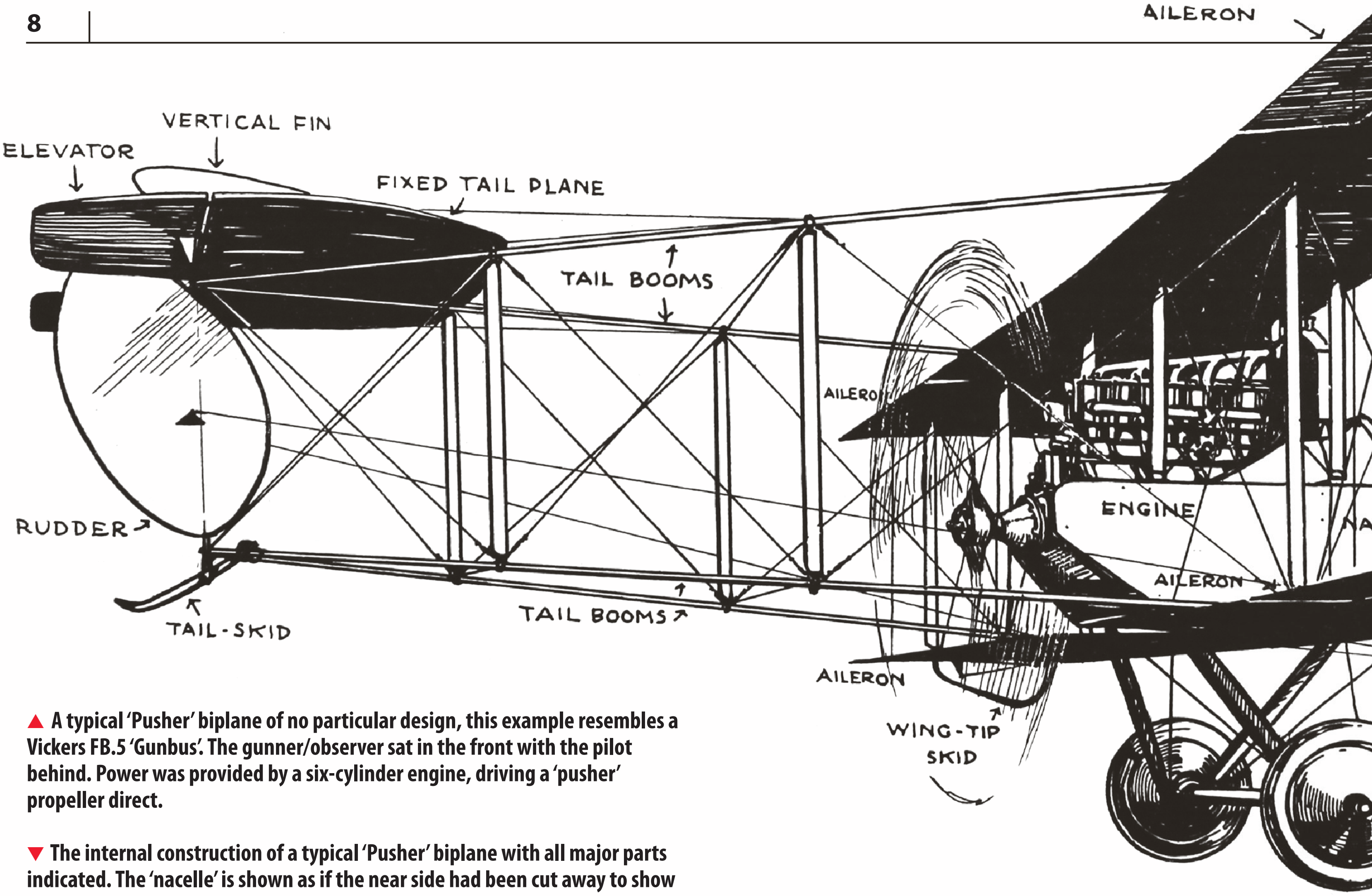
▼ One of the lynchpins in early flying training, in Britain at least, was the Bristol Boxkite, the first massed-produced British aircraft. A heavily-braced, multi-bay pusher machine, the Boxkite was powered by a 50hp Gnôme rotary engine.



▲ First flown in 1910, the Etrich Taube was a good example of an early and very stable reconnaissance aircraft which was very popular with German pilots. One of these pioneering machines became the first aircraft to drop an aerial bomb on November 1, 1911 when Italian, Giulio Gavotti, attacked Ain Zara oasis in Libya.

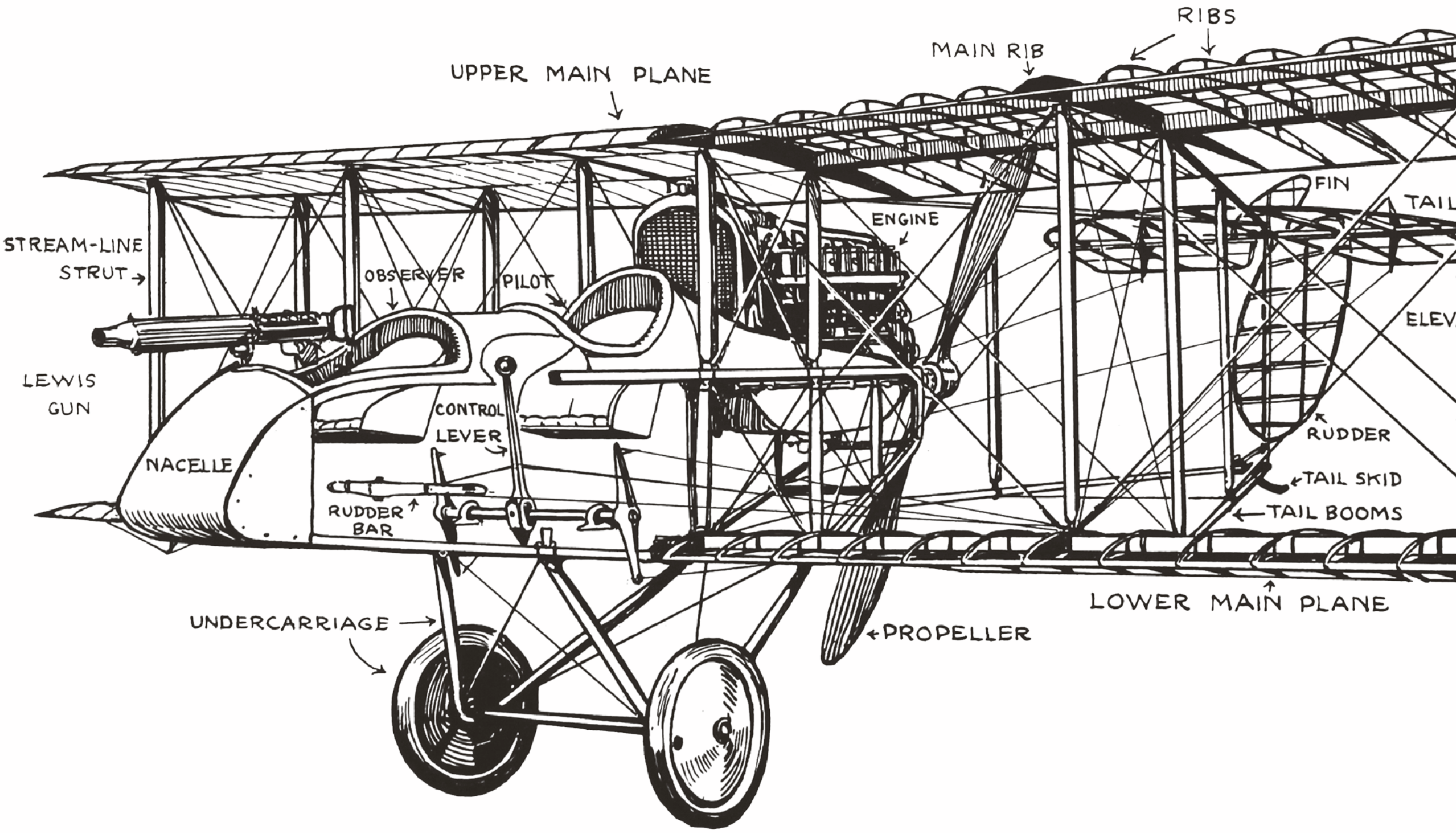
Power limitations

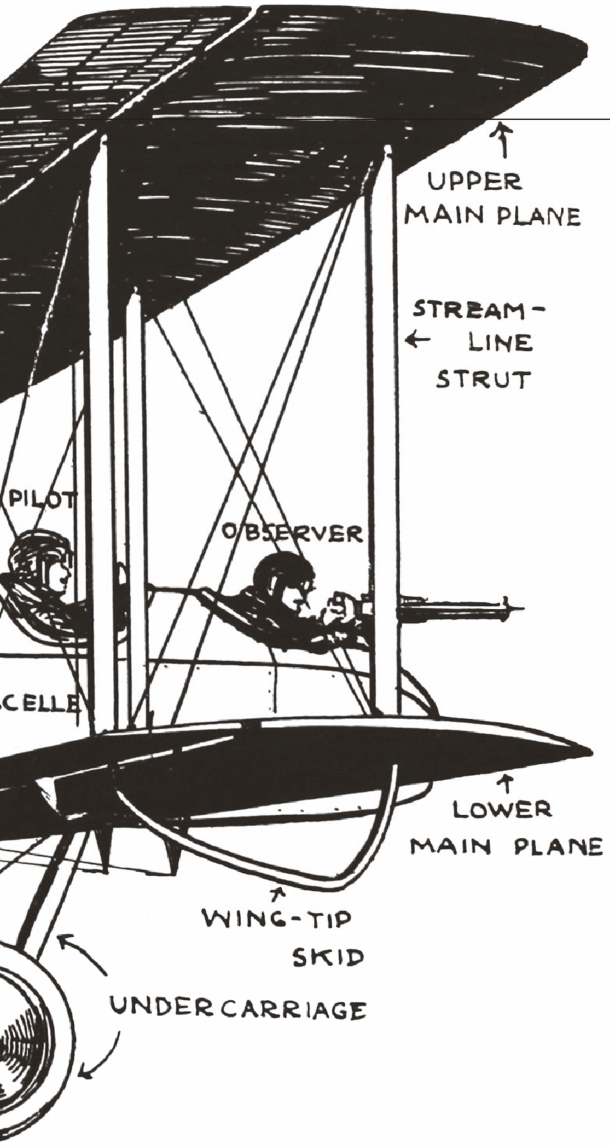
During the period from the Wright Brothers’ epic flight in 1903 and leading up to the First World War, the development of the aircraft was limited by the power to weight ratio of the engine. This lack of power affected the size of the payload which would become a crucial factor if a potential military use was to be found. Structurally, early flying machines were made from primitive materials which lacked strength and it was not uncommon for aircraft to break up in the air when manoeuvres were carried out too quickly or violently. However, by 1909, the military potential of aircraft was being realised, summarised by Italian staff officer Giulio Douhets’ prophetic comment, “the sky is about to become another battlefield no less important than the battlefield on land and sea….In order to conquer the air, it is necessary to deprive the enemy of all means

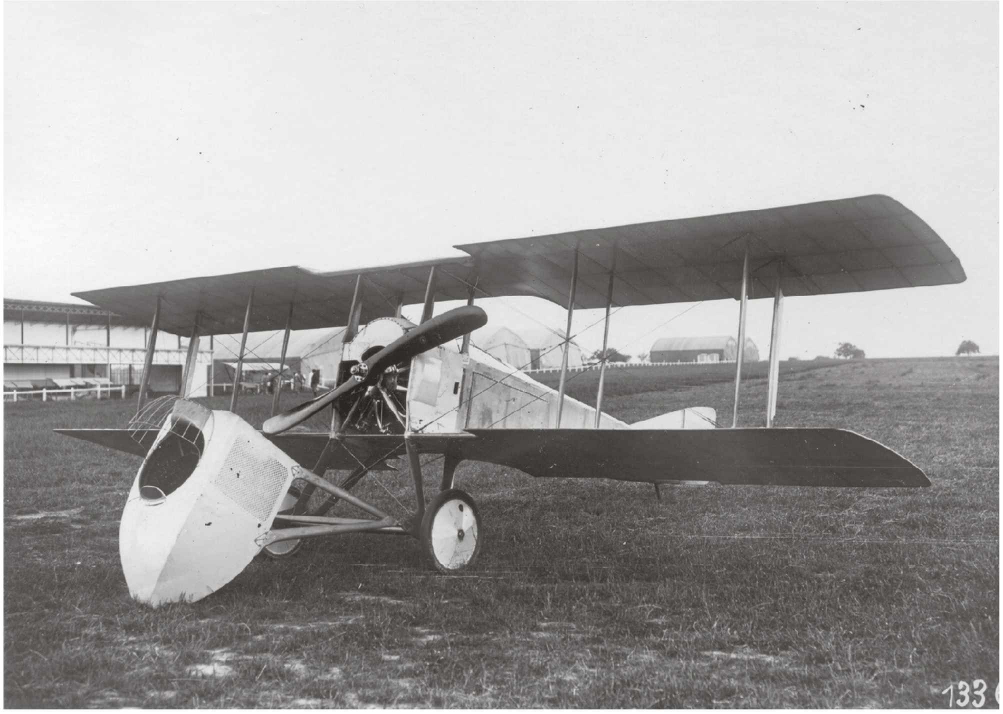


▲ A typical 'Pusher' biplane of no particular design, this example resembles a Vickers FB.5 'Gunbus'. The gunner/observer sat in the front with the pilot behind. Power was provided by a six-cylinder engine, driving a 'pusher' propeller direct.

▼ The internal construction of a typical 'Pusher' biplane with all major parts indicated. The 'nacelle' is shown as if the near side had been cut away to show the seating and control arrangement inside. The 'stream-line' struts are interplane struts shaped to a more or less correct stream-line.







The SPAD A.2 was one of the more novel solutions to the firing through the propeller conundrum which was more successfully overcome, in the short term, by the 'pusher' arrangement. The designer, Louis Bechereau's solution was to mount a streamlined nacelle in front of the aircraft's propeller. While the gunner had an exceptional field of view and fire, the pilot's forward vision was restricted, and there was also the risk to the gunner from the rotating propeller.

of flying, by striking at him in the air, at his bases of operation, or at his production centres. We had better get accustomed to this idea, and prepare ourselves."

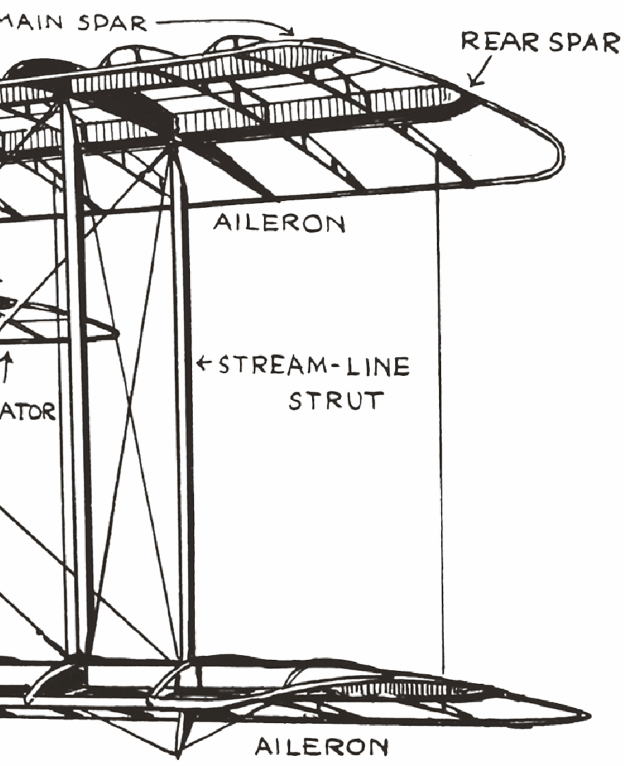
In Britain, a similar prediction was made by Capt Bertram Dickson in 1910, who submitted his thoughts to the Technical Sub-Committee for Imperial Defence about how the use of aircraft in a military capacity was essential and that aerial combat should play a key role in future conflicts. Bertram became the first British military officer to fly the following year and the first to carry out an airborne reconnaissance operation in conjunction with the army. 1911 also saw the formation of the first military aerial unit when the Air Battalion of the Royal Engineers was formed, made up of one company of aircraft, one with small airships, and another with balloons and a fourth with man-lifting kites. In 1912, the RFC (Royal Flying Corp) was formed, with Naval and Military wings to cater for the number of enthusiastic young officers who had already learned to fly at their own expense. The CFS (Central Flying School) was also formed at Upavon to train new recruits under the command of Capt Godfrey Paine, RN, his deputy and chief instructor being none other than Mjr H M Trenchard of the Royal Scots Fusiliers who would go on to become the 'Father of the RAF'.

The early military machines

A typical early aircraft at the time in Britain would have been a Farman or Bristol Boxkite-type of machine with a small pusher engine and the pilot seated in an exposed position on the lower mainplane. Many pilots learned to fly on the Boxkite which had a top speed of just 40mph and was relatively easy to fly. No thought what so ever was given to weaponry at this stage, as the British path for military aviation was clearly defined as reconnaissance and nothing else.

The jury was still out amongst senior military staff about the role that aircraft should play right up to the beginning of the First World War. In Germany, a large amount of time and money had already been invested in the Zeppelin which had pushed all thoughts of conventional aircraft into the background. In August 1914, Germany possessed 230 aircraft, all of which were credited to the army, but at least 50 of them were unserviceable while the French were in a similar position, despite a large number of forward thinking-exercises before the war which heavily involved aircraft. In Britain, only a contribution of 30 aircraft, belonging to three squadrons, were available while the American armed services trailed even further behind and by the time their own air service found its feet in 1917, it had to rely heavily on British and French-built aircraft.

On the ground it quickly became apparent that the old concept of sending cavalry units out on reconnaissance duties would not work on a modern 20th Century battlefield but, if the cavalry could fly and deliver the information needed by generals, the aircraft would take over. This indeed turned out to be the case and early doubts about



the usefulness of flying machines were suddenly turned on their head, from one of low expectation, to unrealistic expectation beyond the capabilities of the early reconnaissance aircraft.

Role dictates configuration

Early military aircraft tended to be of a tractor design, i.e. the engine was mounted on the front of the aircraft and the attached propeller would bite into the air and effectively pull the aircraft along. The tractor configuration was ideal for early reconnaissance machines which, at first, required no armament but, as the war progressed, encounters between opposing aircraft became more frequent and weapons were taken aloft including revolvers, rifles and even hand grenades. The chances of actually hitting an opponent with any of these weapons were obviously slim but a flexibly mounted or fixed machine-gun would potentially bring any aircraft down during this period.

Early tractor aircraft had two options for mounting a machine-gun; these were either in a second cockpit which was operated by an observer/gunner or on top of the wing firing outside the arc of the propeller. The former was used for defending the aircraft. Until a solution was found as to how to fire a machine-gun through a propeller, a range of designs and alternatives would be produced to give an aircraft a decent and controlled arc of forward-fire. Britain led the way beginning with Vickers who had been looking at a pusher design where the pilot and/or a gunner would have a 180° completely clear arc of fire from 1912. The general layout of a pusher was a small nacelle containing the crew to which the engine was mounted at the rear and the mainplanes were attached. The paraphernalia of the tailplane was supported by booms and strengthened with struts and rigging, none of which contributed to the aircraft's performance. Pusher fighters were always a short-term solution to the problem of effective forward fire but the Vickers F.B.5 'Gunbus' and the RAF (Royal Aircraft Factory) F.E.2b and subsequent sub-variants were retained in the front-line until 1917.

Early aircraft such as the Bristol Scout had a single Lewis machine-gun mounted on top of the wing from 1915 but the early cumbersome mounts caused a great deal of drag and were not particularly secure. Problems arose when the ammunition drum or belt, depending on the weapon, needed changing but a solution was produced in the shape of the Foster mounting. This mounting allowed the weapon to be slid along a rail down towards the pilot, making dealing with jams and reloading much easier and when drawn down could also be fired at an angle. Victoria Cross winner Capt Lanoe Hawker, found a solution by mounting a Lewis machine-gun in front of his cockpit, which was angled so that it would fire over the propeller and outwards at an angle of 30°.

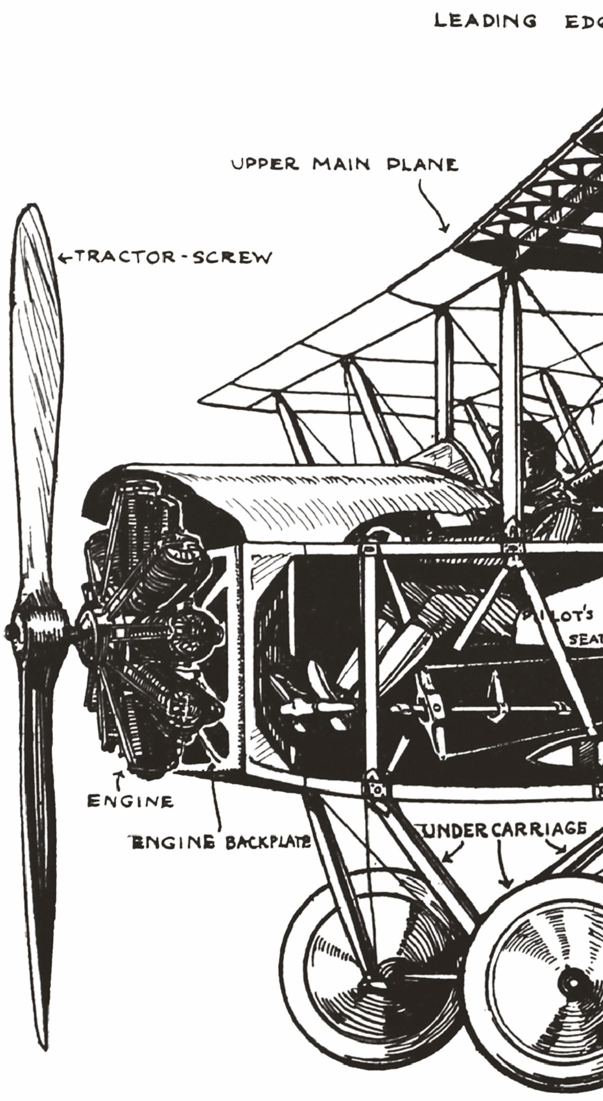
The synchronised solution

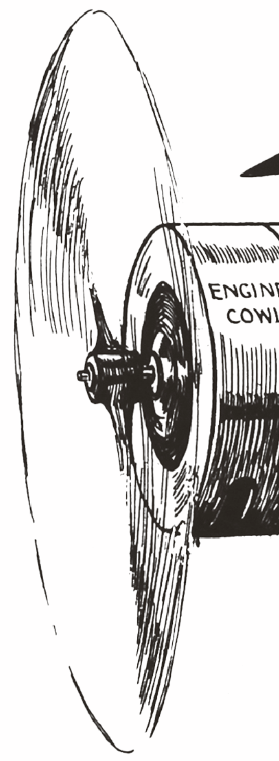
The most natural method of firing a machine-gun from a fighter aircraft would be positioning the weapon between the pilot and the propeller, enabling the entire machine to be pointed at the enemy. Access to the machine-gun to reload and/or clear blockages would also be essential by the pilot, but this entire set-up has one most obvious drawback. The law of averages would see a certain number of the machine-gun rounds fire through the blades but an equal number would also strike the propeller with potentially catastrophic results.

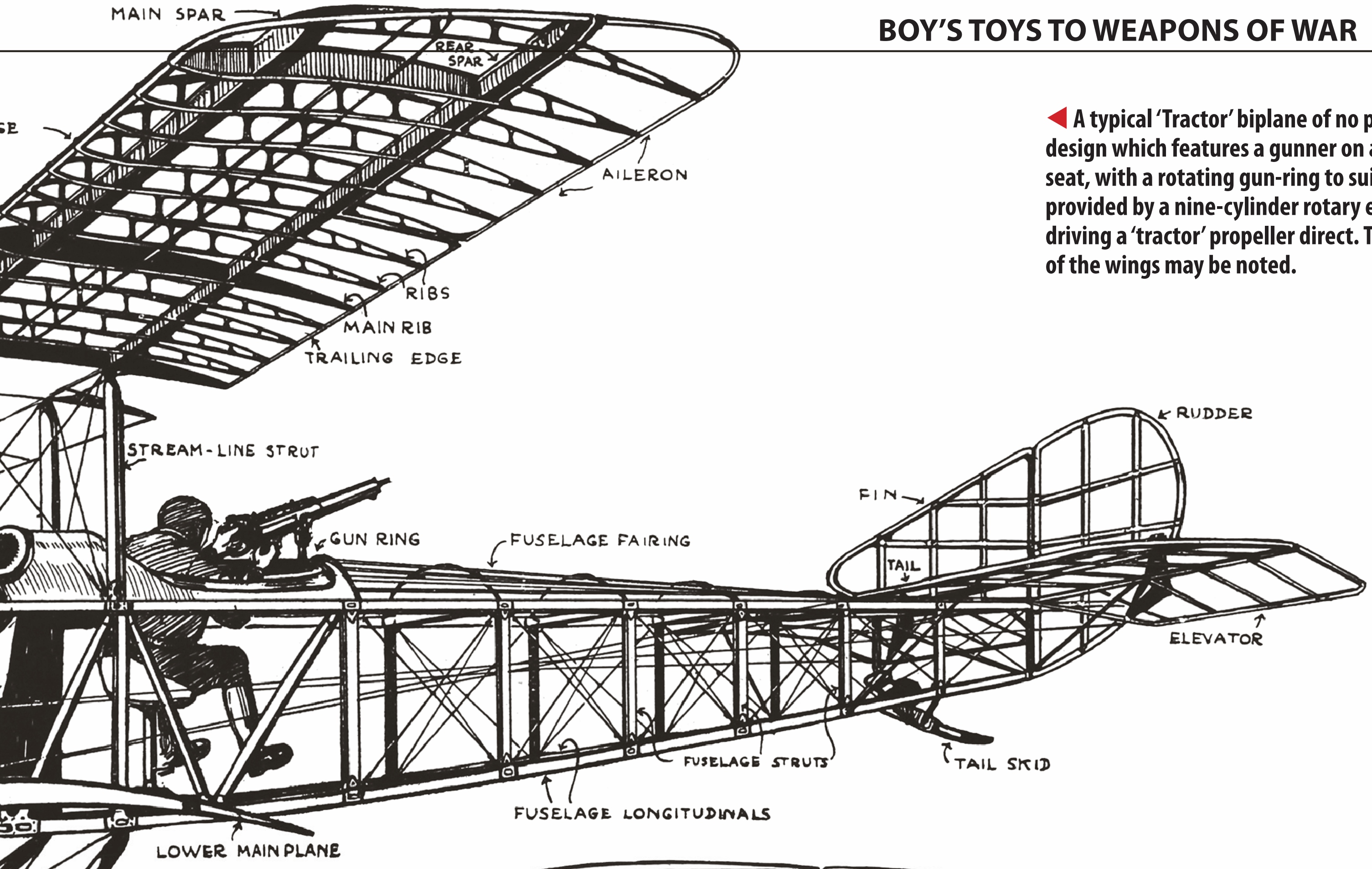
The problem of synchronising a machine-gun was already being tackled before the war by experts working in France, Germany, Russia and Britain. All of the designs worked to a degree, but were generally unreliable, resulting in ricochets and shot-up propellers. Choosing the right weapon to synchronise was the next challenge, not all machine-guns fired at exactly the same rate or consistently, the British Lewis gun being a good example. The Lewis had an open-bolt firing cycle which made it very difficult to predict exactly when the next round would be fired. The British Vickers and the German LMG 08 Spandau and LMG 14 Parabellum (all Maxim recoil-operated machine-guns) used a closed-bolt firing cycle which basically meant that the round was already in the breech at the beginning of the cycle, so the final stage was when the bullet was fired, which could be accurately predicted every time.

The French were determined to synchronise their own Hotchkiss machine-gun which was not the most reliable of weapons for such a delicate purpose. Morane-Saulnier led the way in France and in the event of the Hotchkiss miss-firing, large metal wedges or deflector blades held in place by tie-bars extending from the propeller hub, were placed behind each blade. This configuration was tested by Roland Garros in a Morane-Saulnier Type L in April 1915 and not long after was successfully tested in action. In reality, the system was no more reliable than running the gauntlet with an unsynchronised weapon and Garros and his aircraft were destined to fall into enemy hands.

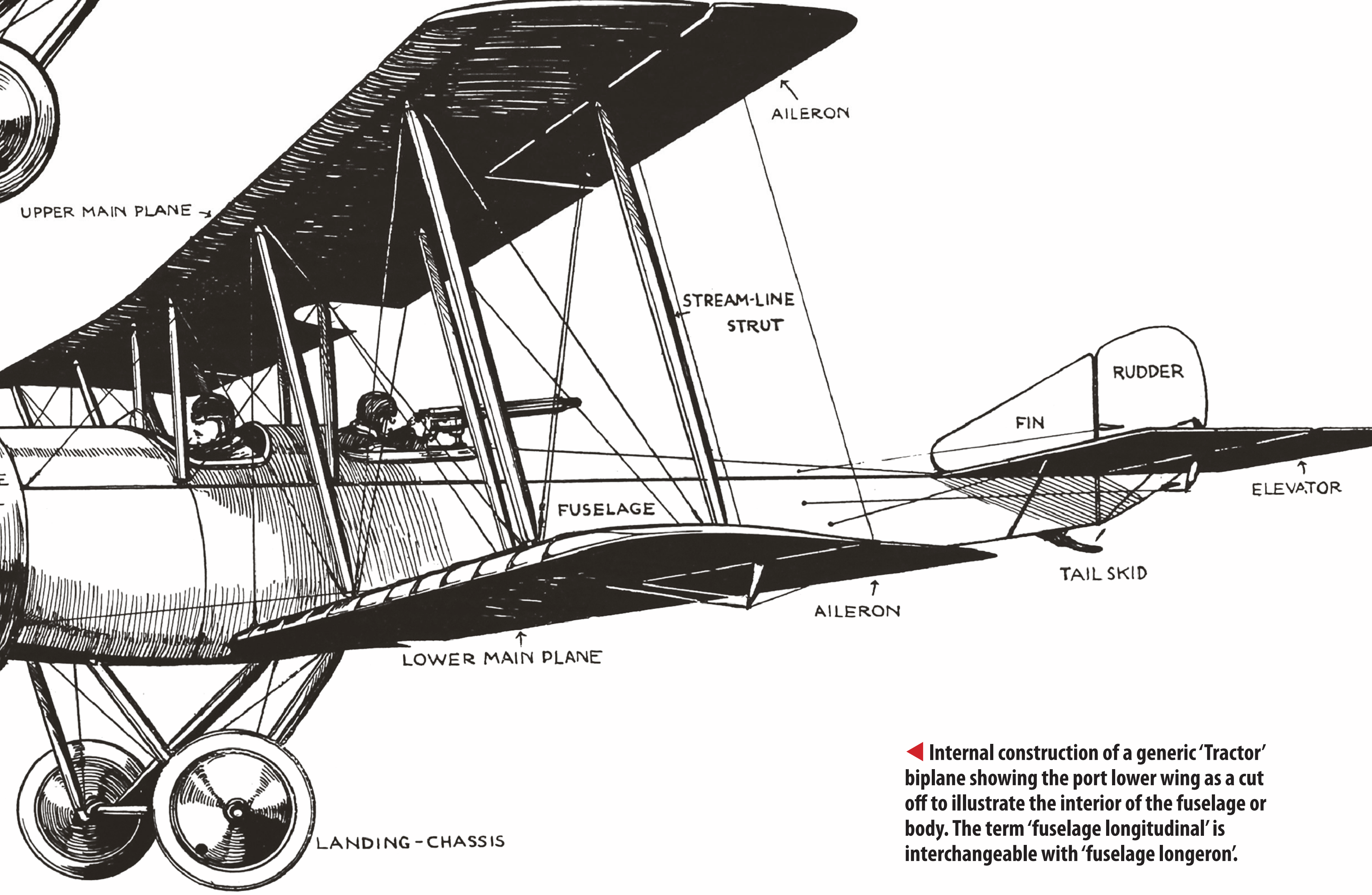
The capture of Garros and his aircraft by the Germans high-lighted to the enemy how close they were to producing a practical and reliable system and with great haste the Morane-Saulnier was delivered to Fokker. Anthony Fokker was ordered to copy the French system but instead chose to completely re-design the synchronisation method and produced one of his own. The result was a war-changing moment; the Germans immediately gained the upper hand in the air thanks to the Fokker Eindecker. A series of fighters followed, all of which were fitted with the very latest synchronisation gear enabling the aircraft's Spandau machine-gun to fire straight through the propeller without striking a blade. All of a sudden the early







◀ A typical 'Tractor' biplane of no particular design which features a gunner on a swivelling seat, with a rotating gun-ring to suit. Power is provided by a nine-cylinder rotary engine driving a 'tractor' propeller direct. The 'stagger' of the wings may be noted.



◀ Internal construction of a generic 'Tractor' biplane showing the port lower wing as a cut off to illustrate the interior of the fuselage or body. The term 'fuselage longitudinal' is interchangeable with 'fuselage longeron'.

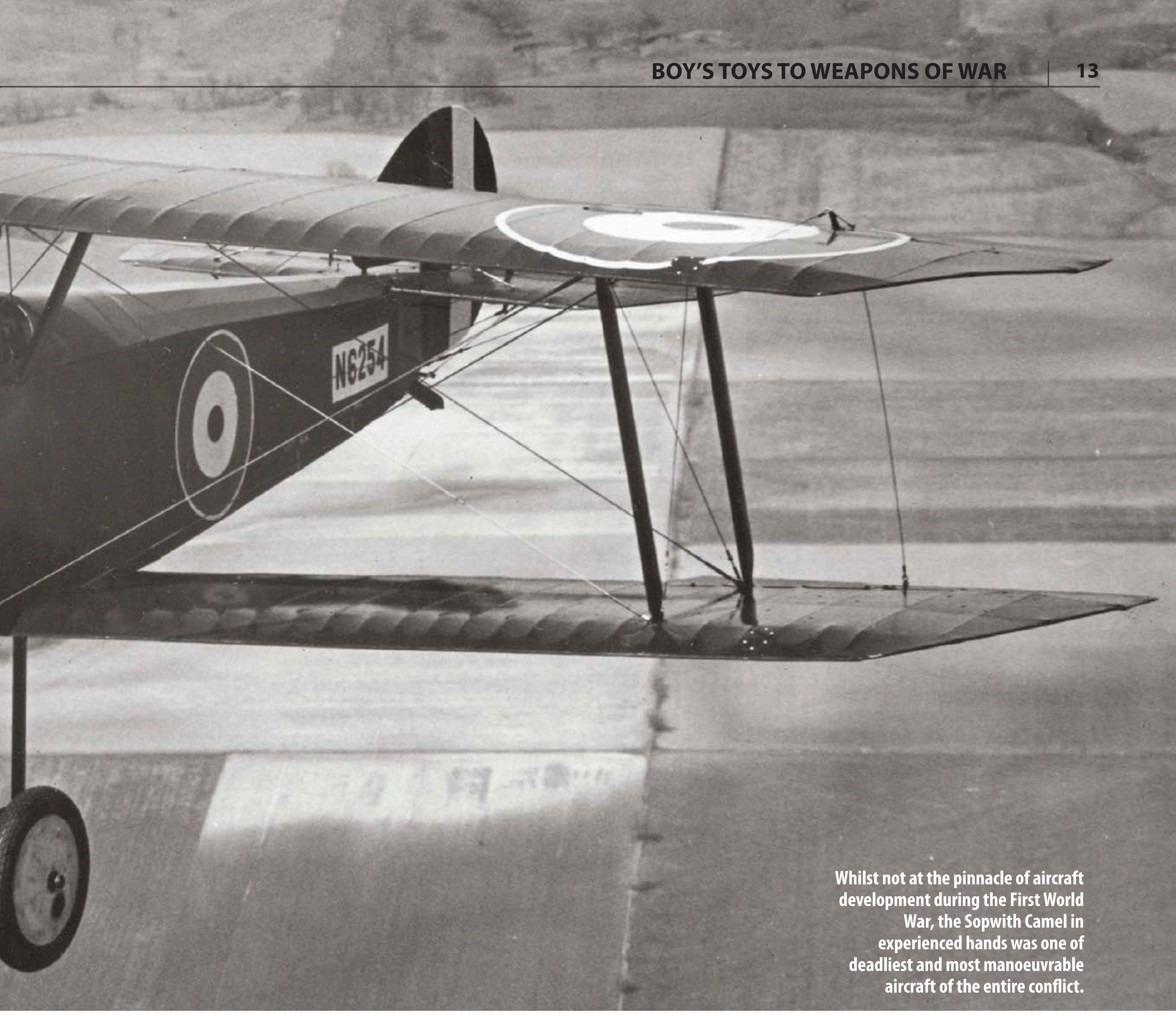
Allied aerial superiority they that had enjoyed was gone as the 'Fokker Scourge' began. However this period of Fokker supremacy was actually partly brought to an end by the pusher F.E.2b and D.H.2, not to mention the Nieuport 11 which had its machine-gun mounted on top of the wing.

Manoeuvrability not over-stability

Early aircraft were designed so that they were as easy to fly as possible and, during the early stages of the First World War, there were examples of pilots who were in action after just three and half hours of flying training. These early machines were inherently stable, which basically meant that they could be flown by anyone of average ability and were generally forgiving to heavy handed inputs plus could be mastered in a short period of time. The disadvantage was that the aircraft were not particularly manoeuvrable, one famous British example being the Royal Aircraft Factory B.E. series of reconnaissance aircraft. The main focus of the design for these machines was about the ability of the crew to carry out their task efficiently instead of worrying about flying the aircraft. This was all well and good and there is no doubt that the B.E. crews performed their duties well but, when it came to a fight with an enemy machine, even an early example like a Fokker Eindecker, the B.E. stood no chance of making its escape through aircraft performance or manoeuvrability alone.

Within a very short period of time, it was realised that manoeuvrability was the most important factor to the survivability of the pilot and his aircraft, even coming second to firepower. If the pilot of a fighter could not get into position behind the enemy, no amount of weaponry would win the day.

The most manoeuvrable designs of the First World War would prove to be some of the most difficult aircraft to fly, especially for a novice, but would ultimately become the most successful. Not only was stability designed out of the aircraft but the very nature of the rotary engine and how it operated was factored in. The rotary engine produced natural torque because of how the pistons rotated about the crankshaft and as such, all aircraft fitted would have a natural tendency to turn unassisted in the same direction that the engine was turning. This factor, combined with the rotary's excellent power to weight ratio was fully exploited in some classic First World War fighters such as the Sopwith Triplane and Camel and the infamous Fokker Dr.I Triplane. The Camel was one of the most challenging aircraft to fly and many inexperienced pilots suffered at the hands of the Sopwith fighter before they had a chance to have



Whilst not at the pinnacle of aircraft development during the First World War, the Sopwith Camel in experienced hands was one of deadliest and most manoeuvrable aircraft of the entire conflict.

a crack at the enemy. The Camel probably took advantage of the rotation of the rotary engine more than any other early fighter to such a degree, it was quicker to snap turn to the right to face left than it was to attempt the manoeuvre in the conventional manor. This manoeuvre on its own caught many enemy off guard, thinking that the Camel pilot had made the wrong move, only to find the little fighter coming straight back on them or suddenly on their own tail.

Rapid development

Military technology, certainly during the major conflicts of the 20th Century would develop rapidly as opposing forces tried to produce ever more efficient killing machines. Aviation during the First World War saw aircraft at the start of the conflict with little more than 90hp and a top speed of 72mph and by contrast at the end of it with engines of over 200hp and top speeds touching 140mph. Reliability, endurance, the number of weapons and the ability to carry them all improved and the number of aircraft involved vastly increased.

The overall military attitude concerning aircraft did not move on a great deal but the aircraft was clearly here to stay and, as the war progressed, the concept was accepted more and more by the generals on the ground. The advantage of aerial reconnaissance was grasped from a very early stage but it took a while before aircraft were actually employed as part of planned strategy. Having advanced its original tasking of reconnaissance, the flying machine quickly became employed in the role of the fighter, bomber, ground attack, coastal defence and long-range reconnaissance. The role of the bomber, which is not touched on a great deal within this publication, advanced a long way in the space of four years. At the beginning of the war, bombs were literally dropped by hand over the side of the cockpit in a 'hit and hope' technique which may have kept the troops in the trenches heads down, but did little more than that. Later on in the war, the Germans terrorised the British population with their Gothas which were surpassed in reply by the British at the very end of the conflict with the Handley Page O/100 and O/400, the latter being capable of carrying up to 2,000lb over a great distance.

The First World War put the aircraft on the military map and despite not playing a decisive part in the conflict, which was unsurprising considering the first dedicated military aircraft did not appear until 1911, it was clear that the capability of an organised aerial force had great potential in wars of the future.

The Royal Flying Corp's successful series of Bleriot Experimentals

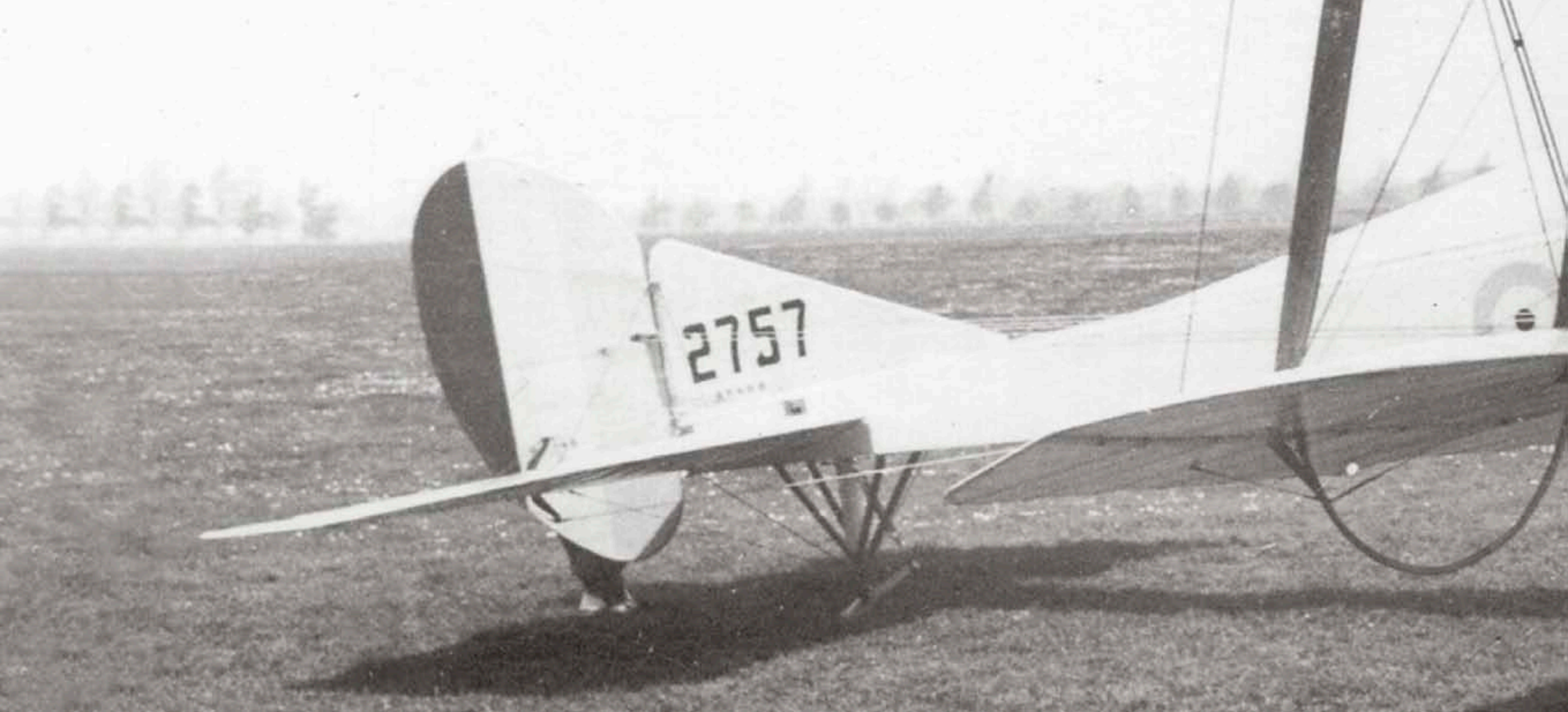
BUILT BY BRITAIN'S premier manufacturers of early military aircraft, the Royal Aircraft Factory based at Farnborough and designed by the great Geoffrey de Havilland, the B.E. (Bleriot Experimental) series of aircraft were, on paper at least, a great success. Over 3,500 of the two-seat single-engined biplanes were built, ranging from the original B.E.2 to the BE.12B, the latter variants remaining in service until the end of the First World War, albeit in the second line. However, the B.E.s were not great combat machines and their losses over the trenches, up to 1916 were disturbingly high to such a degree, many debates about the suitability of the type in service were carried out in Parliament.

During the early stages of the war the B.E. was no match for the Eindecker and nicknames such as 'Fokker Fodder' began to take hold as the vulnerability of the type was quickly exposed. The aircraft remained vulnerable throughout its development but as allied fighters improved, the loss rate of the B.E.s by mid-1916 had been turned around to one of the lowest of all major RFC types in service. However as the toing and froing of technology swung back in favour of the Germans, losses rose again culminating in the notorious 'Bloody April' campaign of 1917 which saw 60 B.E.s lost.

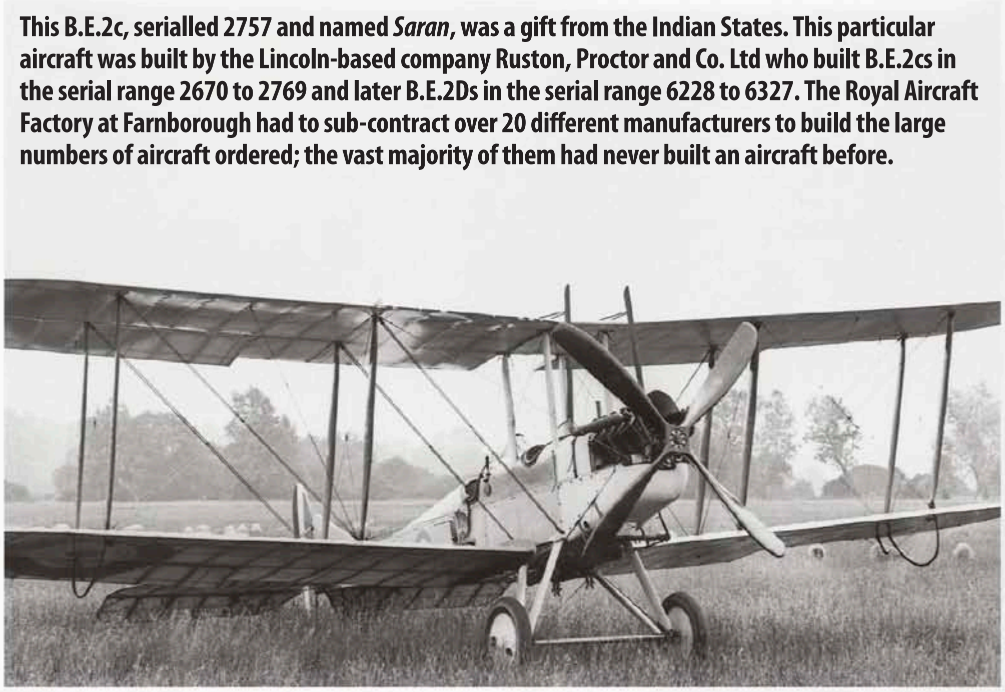
All in all, Captain Albert Ball's comment, 'It was a bloody awful aeroplane' just about sums up the B.E., but it was ultimately all the Allies had available at the time. The type served with 72 RFC squadrons, several wings of the RNAS and several units of the Australian Flying Corps.

▲ An unidentified B.E. pictured in service with 2 Wing, RNAS which operated from Imbros and Mudros. The Turkish island of Imbros was used as a staging post by the Mediterranean Expeditionary Force prior to the ill-fated invasion of the Gallipoli peninsula.

▼ When the B.E.2 first flew in 1912 at first, the performance of the aircraft seemed very promising, endorsed when the prototype raised the British altitude record to 10,560ft on August 12, 1912. Originally designed as an artillery spotter and reconnaissance aircraft, the B.E.s were very stable aircraft and the general accident rate was fairly low.



This B.E.2c, serialled 2757 and named *Saran*, was a gift from the Indian States. This particular aircraft was built by the Lincoln-based company Ruston, Proctor and Co. Ltd who built B.E.2cs in the serial range 2670 to 2769 and later B.E.2Ds in the serial range 6228 to 6327. The Royal Aircraft Factory at Farnborough had to sub-contract over 20 different manufacturers to build the large numbers of aircraft ordered; the vast majority of them had never built an aircraft before.



RAF B.E.2C TECHNICAL INFORMATION

FIRST FLIGHT: (B.E.2) Feb 1, 1912 by Geoffrey de Havilland

ENGINE: One 90hp RAF 1a air cooled V-8

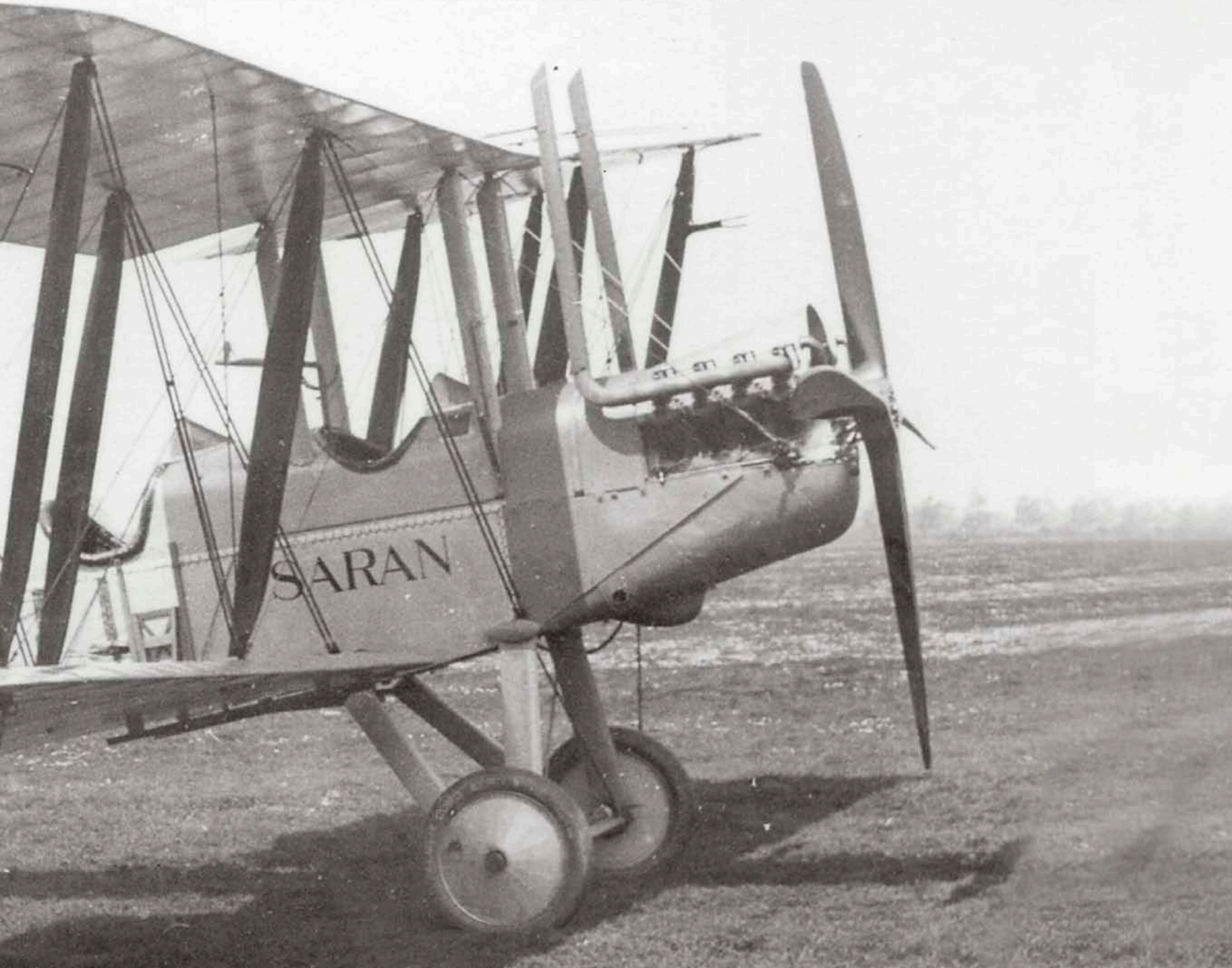
SPAN: 37ft

LENGTH: 27ft 3in

MAX SPEED: 72mph at 6,500ft

CREW: Two, pilot and observer

ARMAMENT: (Defence) One .303in Lewis machine-gun; (Offence) 224lb of bombs



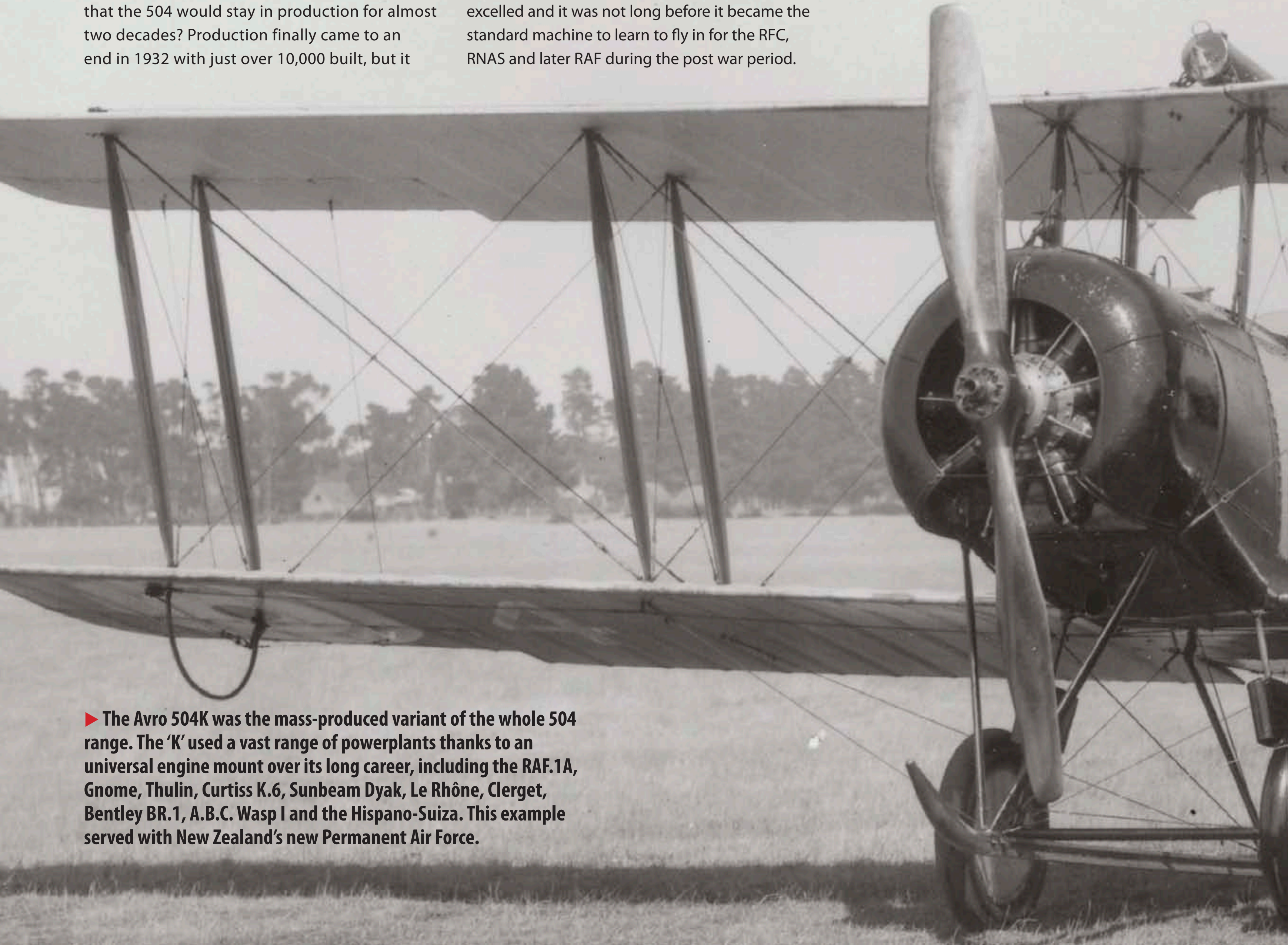
The prolific, long-serving Avro 504 series

THE AVRO 504 is one of the world's great iconic aircraft which firmly put A.V. Roe and his fledgling company on the aviation map. The Avro 504 caused quite a stir when it was revealed to the general public for the first time on September 20, 1913 when it was entered into that year's Aerial Derby at Hendon. Not only did the 504 look fast, the aircraft went on to finish in fourth place having achieved an average speed of 66.5mph. What is remarkable about this result is that the machine had only flown for the first time just two days earlier!

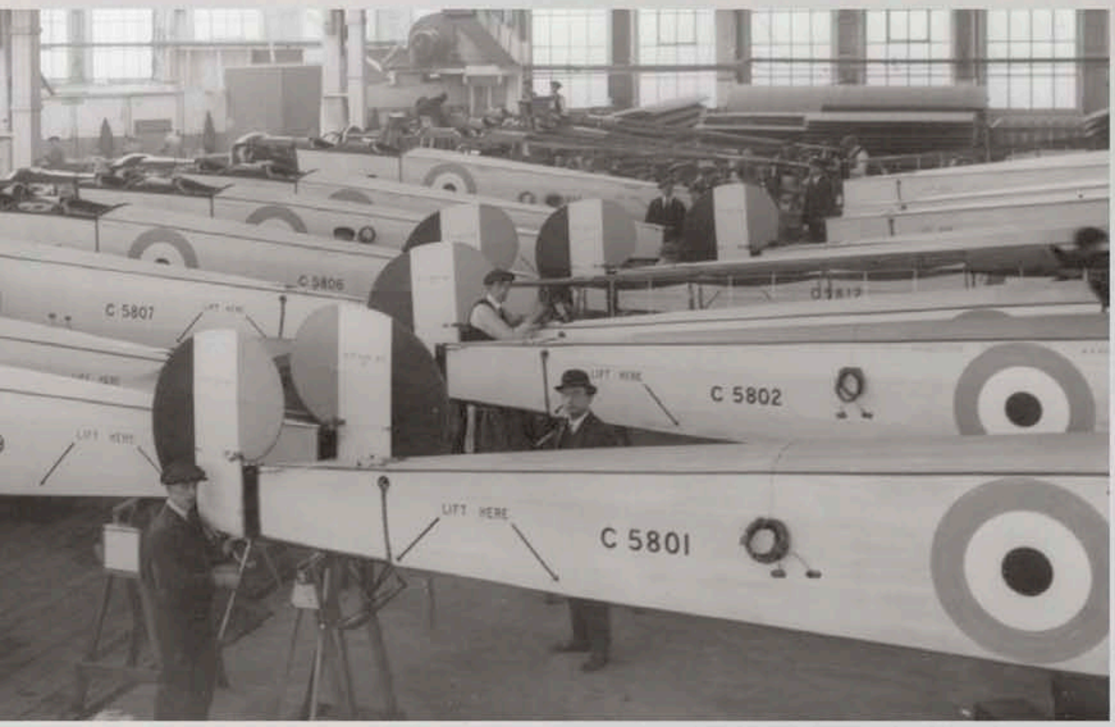
The first of a large number of War Office contracts was placed in 1913 for a dozen machines, followed by a tentative order by the Admiralty and a larger order for 44 aircraft, serialled 750 to 793 which would be the first to serve with the RFC. Who would have predicted that the 504 would stay in production for almost two decades? Production finally came to an end in 1932 with just over 10,000 built, but it was the First World War that saw the greatest demand and out of the grand total, 8,970 were constructed during the conflict.

By the beginning of the war large numbers of 504s were already in service and as a result the first benchmark operations and victories were carried out by the Avro biplane. On August 23, 1914, Lt C W Wilson and his observer Lt C E C Rabagliati forced down a Taube with a pistol, marking the first victory in action of the RFC. In the hands of the RNAS three 504s successfully bombed the Zeppelin works at Friedrichshafen on November 21, 1914 using four 20lb bombs apiece.

It was not long before the 504 was obsolete over the trenches but a new operational role as a Home Defence fighter to replace the B.E.2c saw the type remain in service until the end of the war. However it was in the training role that the 504 excelled and it was not long before it became the standard machine to learn to fly in for the RFC, RNAS and later RAF during the post war period.



▶ The Avro 504K was the mass-produced variant of the whole 504 range. The 'K' used a vast range of powerplants thanks to an universal engine mount over its long career, including the RAF.1A, Gnome, Thulin, Curtiss K.6, Sunbeam Dyak, Le Rhône, Clerget, Bentley BR.1, A.B.C. Wasp I and the Hispano-Suiza. This example served with New Zealand's new Permanent Air Force.



AVRO 504 TECHNICAL INFORMATION

FIRST FLIGHT: (Prototype) September 18, 1913 by F P Raynham

ENGINE: One 80hp Gnome or Gnome Monosoupape

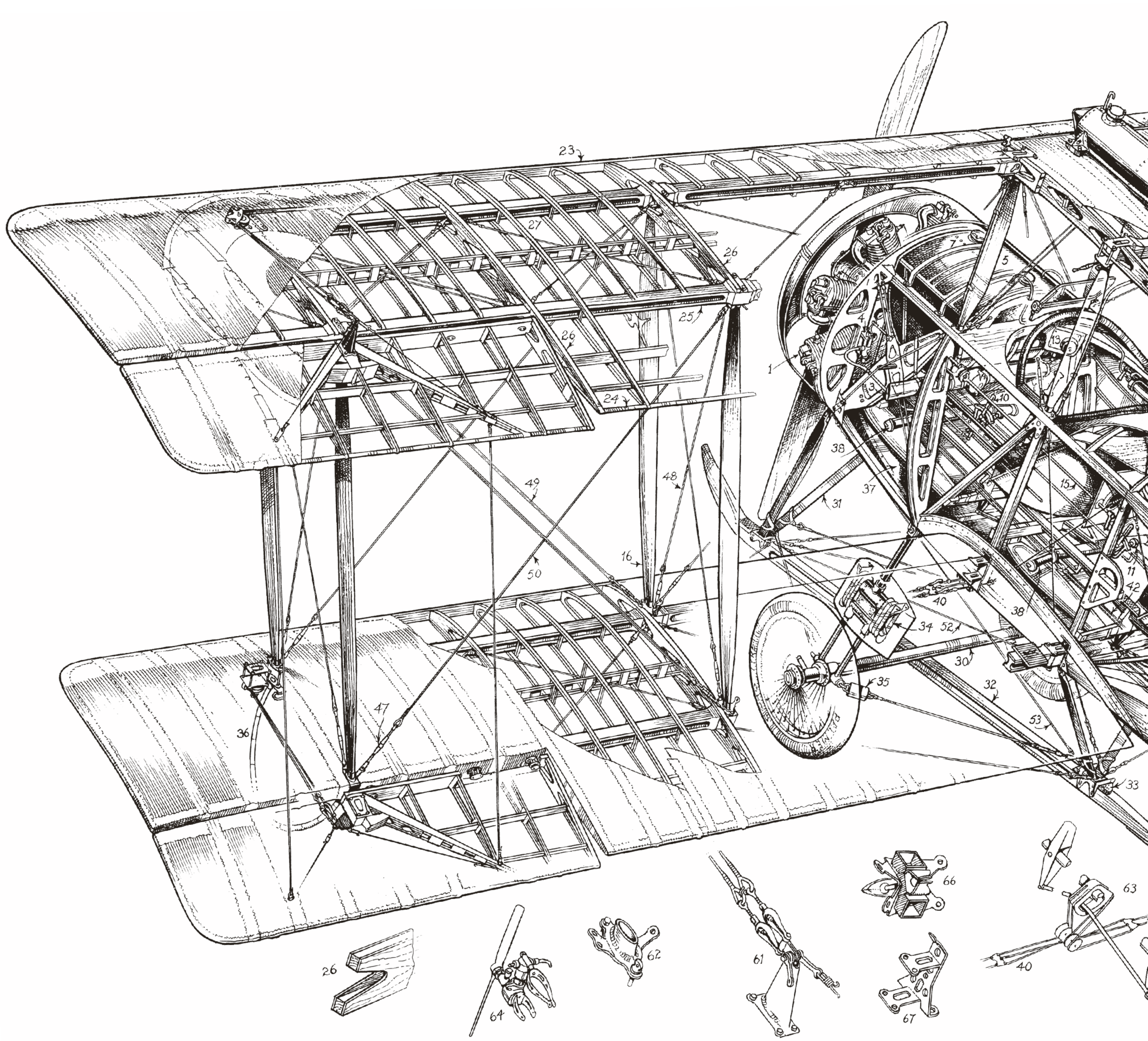
SPAN: 36ft

LENGTH: 29ft 5in

MAX SPEED: 81mph

CREW: Two, pilot and observer

◀ **The serials on this batch of 504s give them away as 504Js in the range C5751 to C6050 which were built by Harland & Wolff Ltd. in Belfast. The 504J was solely built for use as a trainer and was powered by 80hp Le Rhône or a 100hp Gnome although the majority of them were later converted to 504K standard with a universal engine mount.**

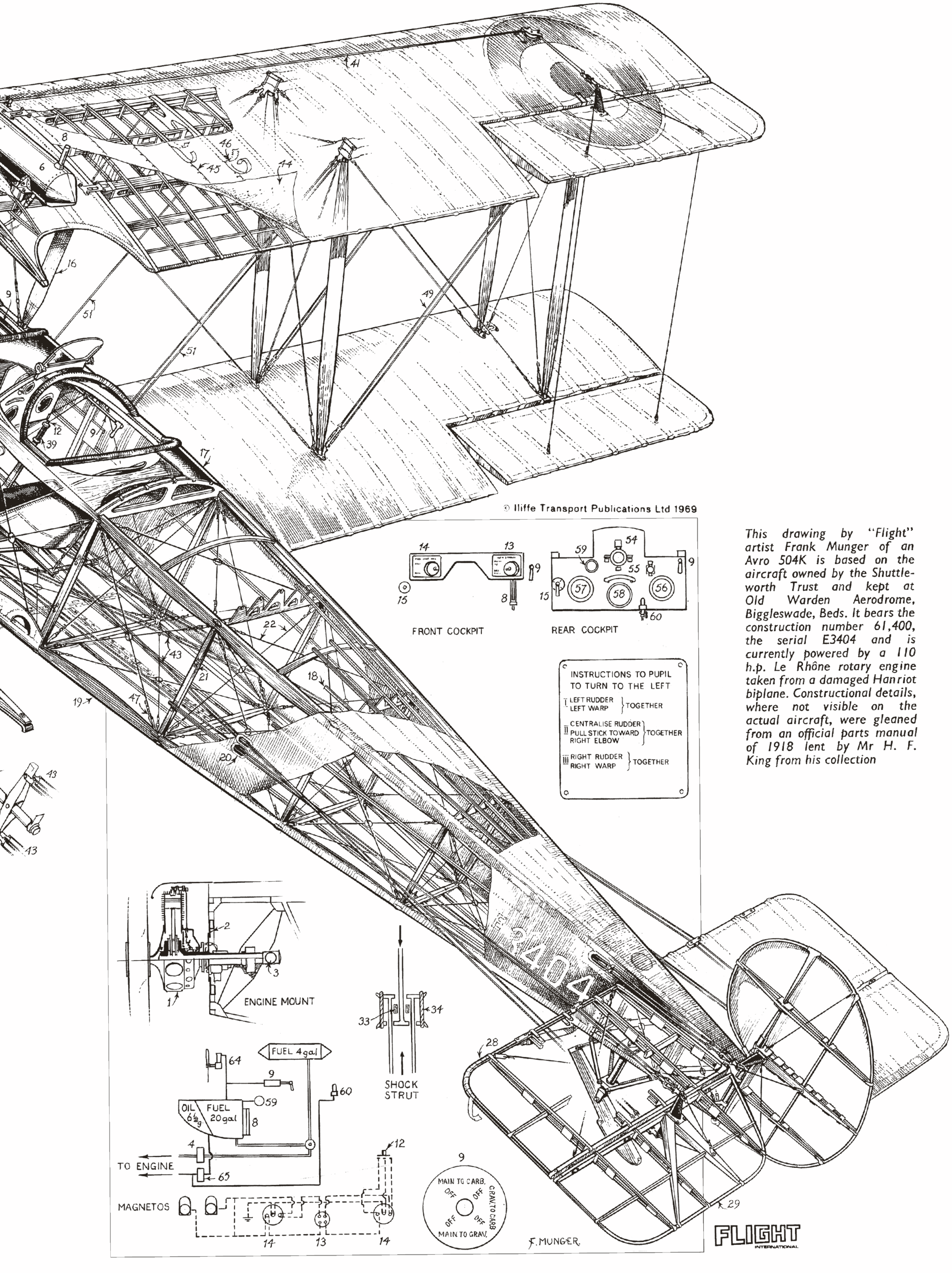


1 110 h.p. Type J Le Rhône rotary engine
2 Engine mounting plate
3 Air intake
4 Mixture needle-valve
5 Main fuel tank, 20gal
6 Gravity fuel tank, 4gal
7 Oil tank, $6\frac{1}{2}$gal
8 Sight glass (fuel contents)
9 Air pump for tank pressurisation
10 Throttle control
11 Needle-valve control
12 Ignition cut-out button
13 Master switch
14 Running switch
15 Fuel cock
16 Spruce struts
17 $\frac{1}{8}$in ply decking
18 Spruce stringers
19 Ash longerons and $\frac{1}{8}$in ply stiffeners
20 Aluminium fabric-guards
21 Spruce side-struts
22 Steel wire (10, 12 and 14 s.w.g.)
23 Spruce leading-edge
24 22 s.w.g. mild steel tube trailing-edge
25 Spruce spars
26 Box ribs, spruce and $\frac{1}{16}$in ply
27 Light ribs, spruce
28 Leading-edge 20 s.w.g. mild steel tube
29 Trailing-edge 22 s.w.g. mild steel tube
30 Axle, 50-ton steel tube
31 V struts, 10 s.w.g. mild steel
32 Ash skid
33 Rubber block
34 Rubber bungee
35 Spring buffer
36 Malacca cane tip skid
37 Aluminium undershield
38 Ash rudder bar
39 Control column (walnut)
40 Aileron control cable
41 Aileron balance cable (duplicated)
42 Rudder cable
43 Elevator cables
44 Unbleached fabric covering
45 Stitching
46 Covering tape
47 Turnbuckles
48 Incidence wires, 2 BA*
49 Flying wires, $\frac{1}{4}$in BSF (double)
50 Landing wires, 2 BA
51 Inner flying wires, $\frac{9}{32}$in BSF (double)
52 Skid bracing wires, front, $\frac{1}{4}$in BSF
53 Skid bracing wires, rear, 2 BA
54 Compass
55 Cross-level
56 Tachometer
57 Airspeed indicator
58 Altimeter
59 Air pressure
60 Pulsometer (engine oil)
61 Typical control arrangement at surface
62 Typical strut fitting
63 Control system
64 Wind-driven air pump (tank pressurisation)
65 Oil pump
66 Fuselage side-strut fitting
67 Spar-to-fuselage fitting

* Several of the rigging-wire specifications in the original drawings were given in end-thread sizes instead of in s.w.g.

Avro 504 Data

Span	35ft 0in
Chord	4ft $9\frac{3}{4}$in
Gap	5ft 6in
Length	28ft 11in
Height	10ft 5in
Wing area (including ailerons) ...	330 sq ft
Tailplane area	26 sq ft
Elevator area	18 sq ft
Rudder area	9 sq ft
Tailplane span	10ft
All-up weight	1,823lb
Payload	360lb
Fuel and oil	233lb
Max speed (6,000ft) ...	85 m.p.h.
Climb to 6,000ft	9min



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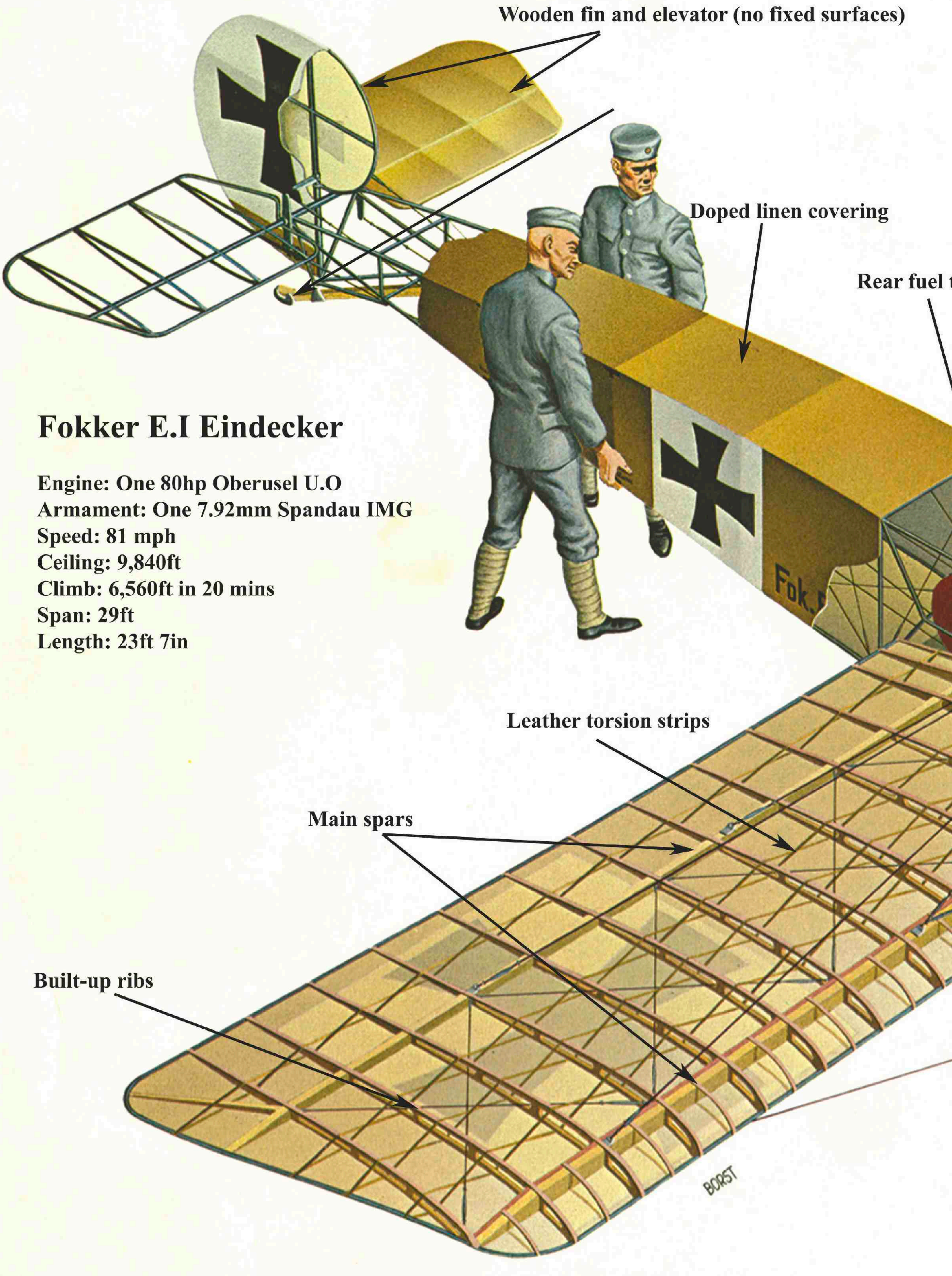
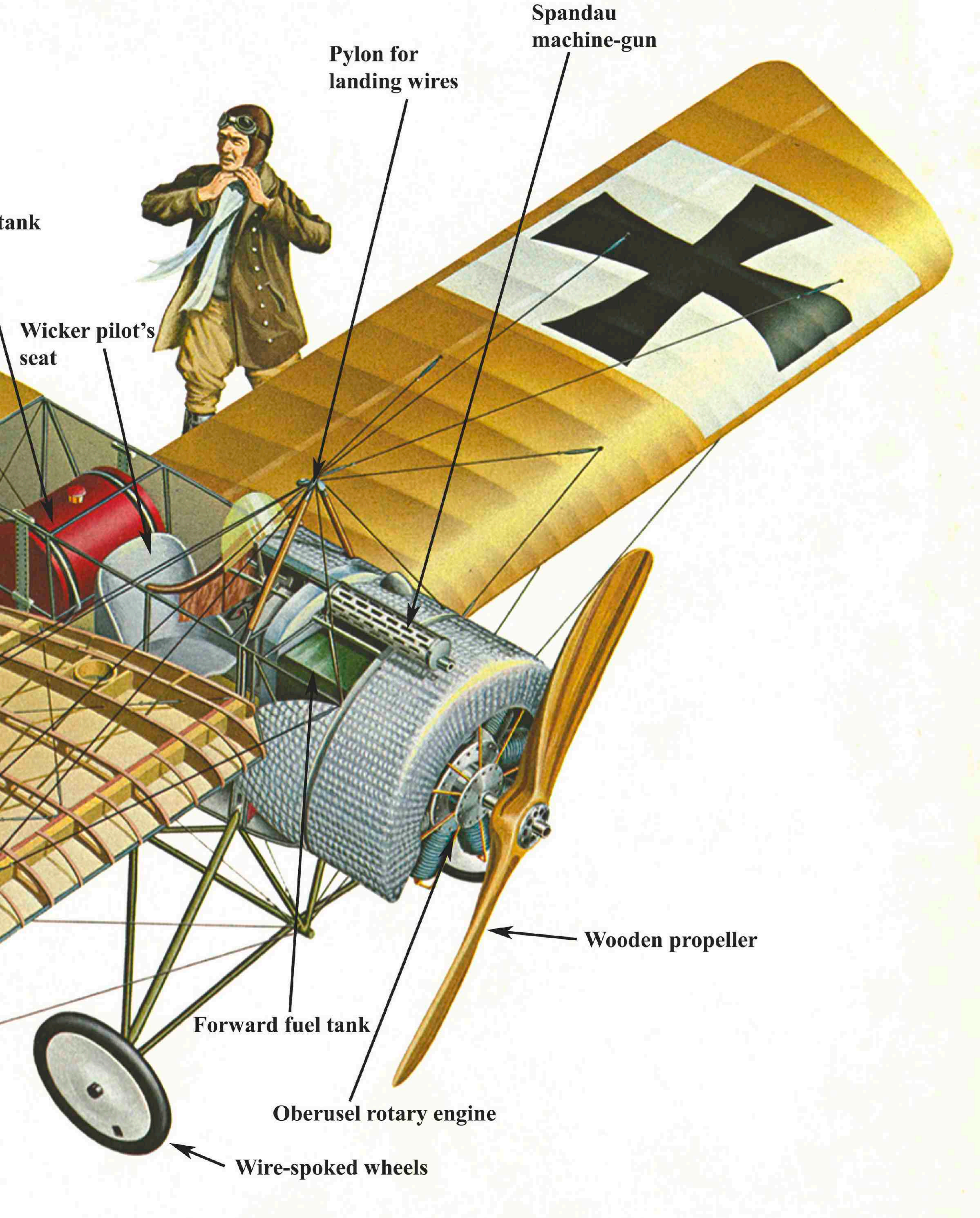
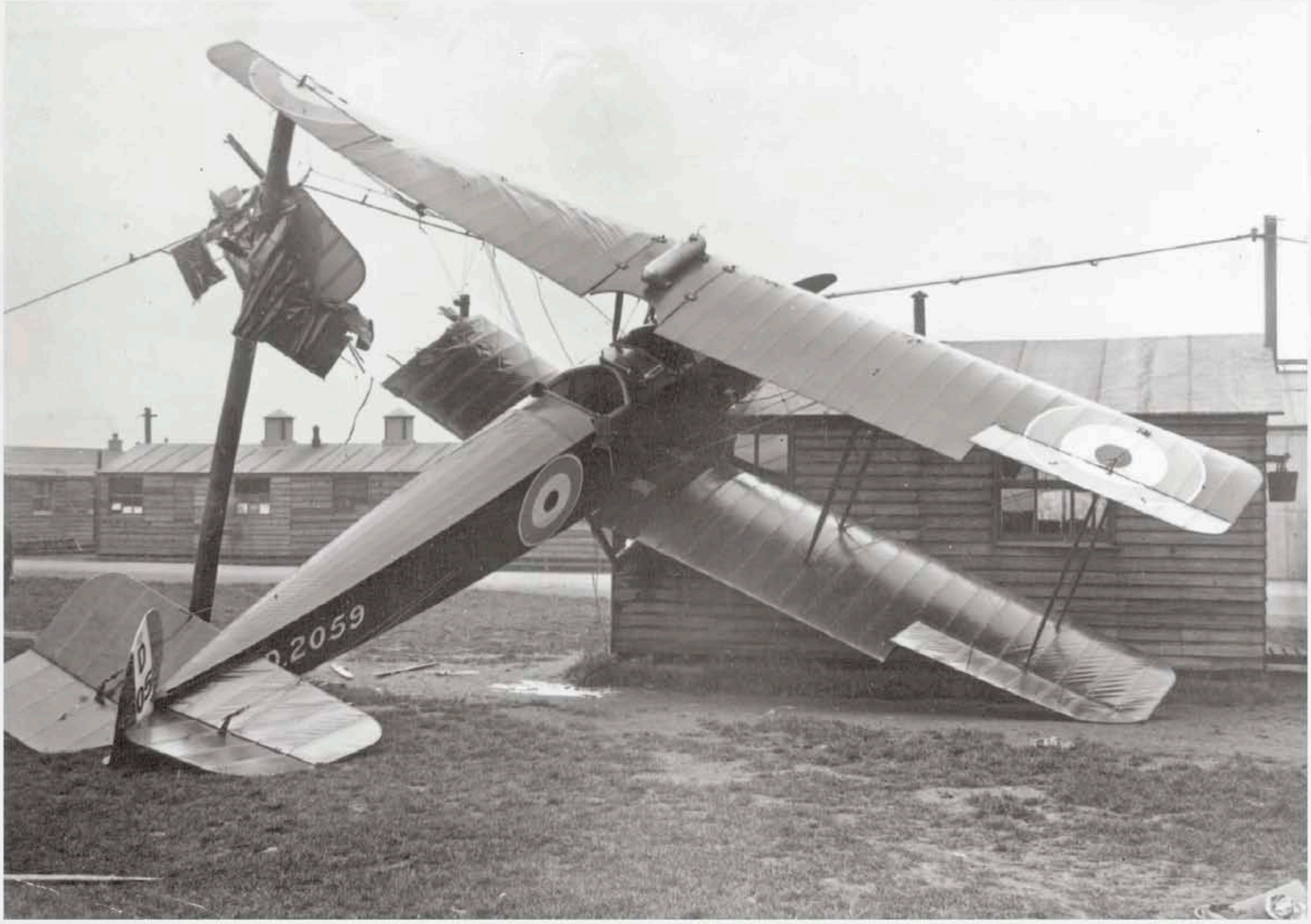
This drawing by "Flight" artist Frank Munger of an Avro 504K is based on the aircraft owned by the Shuttleworth Trust and kept at Old Warden Aerodrome, Biggleswade, Beds. It bears the construction number 61,400, the serial E3404 and is currently powered by a 110 h.p. Le Rhône rotary engine taken from a damaged Hanriot biplane. Constructional details, where not visible on the actual aircraft, were gleaned from an official parts manual of 1918 lent by Mr H. F. King from his collection

Fokker E.I Eindecker

Engine: One 80hp Oberusel U.O
Armament: One 7.92mm Spandau IMG
Speed: 81 mph
Ceiling: 9,840ft
Climb: 6,560ft in 20 mins
Span: 29ft
Length: 23ft 7in

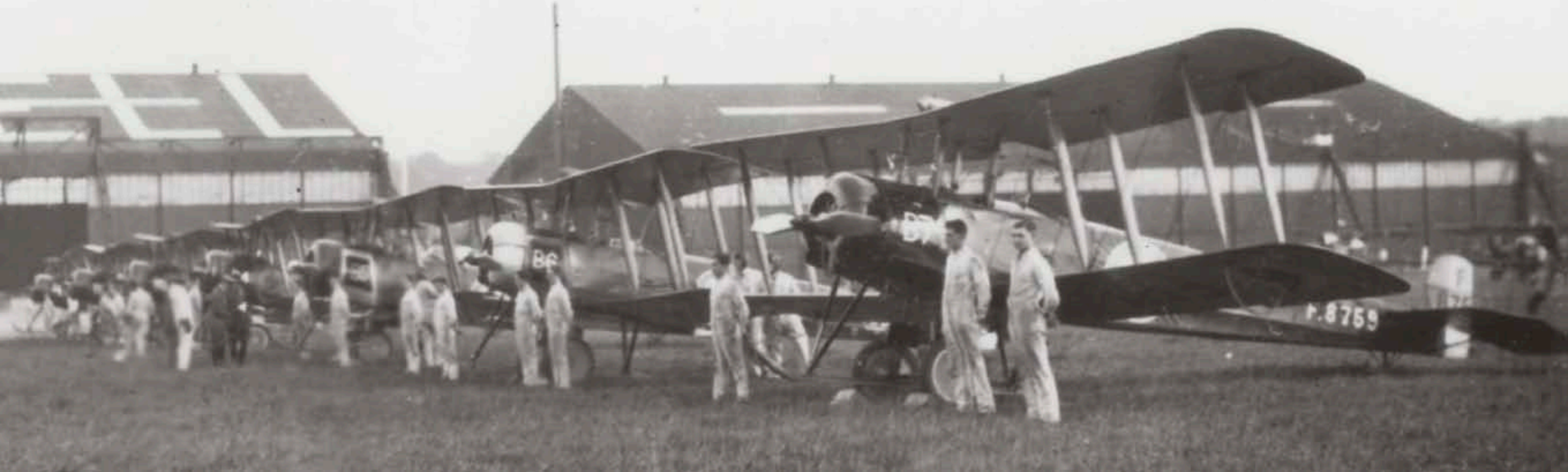


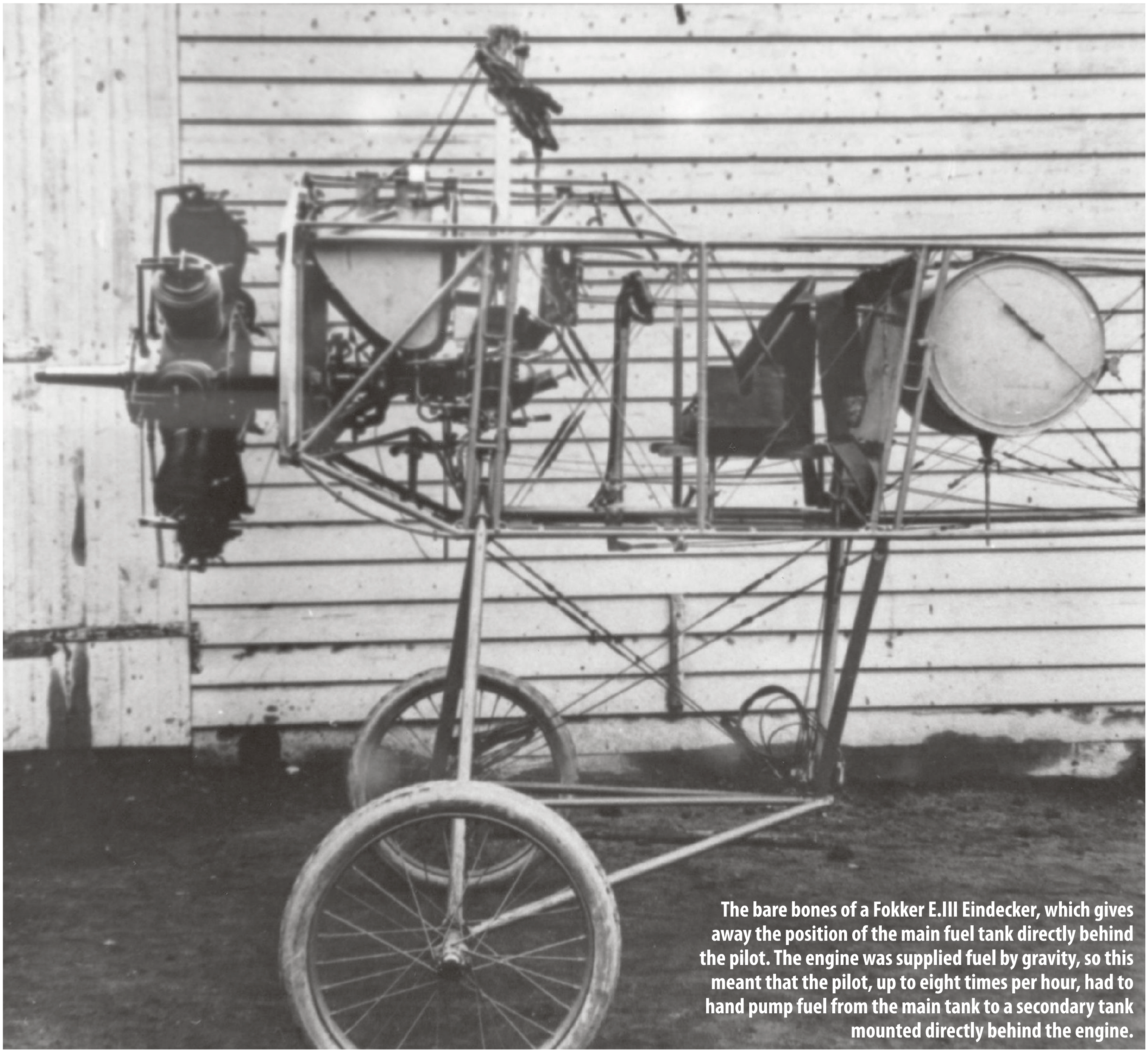

Spandau
machine-gun
Pylon for
landing wires
tank
Wicker pilot’s
seat
Wooden propeller
Forward fuel tank
Oberusel rotary engine
Wire-spoked wheels



▲ A classic prang in 1918 by a student pilot learning his trade the hard way at 49 TS (Training Station) at Catterick. The 504K is D2059 which was built by ex-shopfitters Frederick Sage & Co. Ltd of Peterborough, one of 309 built by the company.

▼ A proud line of Avro 504Ks at the RAF College, Cranwell including F8759 'B7' in the foreground. Built by Parnall & Sons as part of an order for 150 aircraft placed in June 1918, F8759 remained in service in Middle East until April 1927.





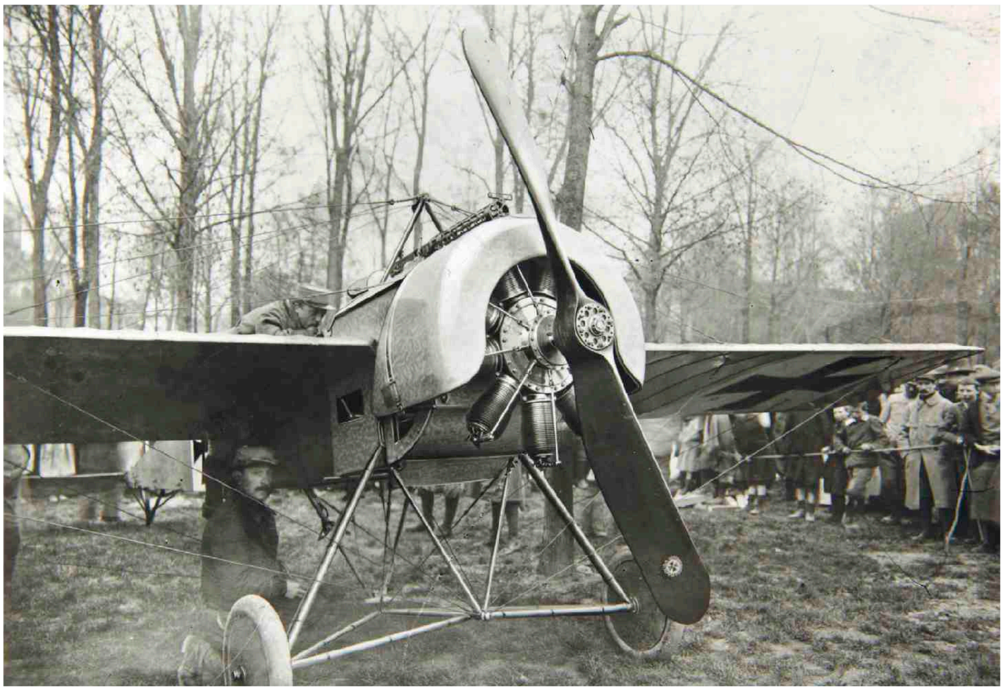
The bare bones of a Fokker E.III Eindecker, which gives away the position of the main fuel tank directly behind the pilot. The engine was supplied fuel by gravity, so this meant that the pilot, up to eight times per hour, had to hand pump fuel from the main tank to a secondary tank mounted directly behind the engine.

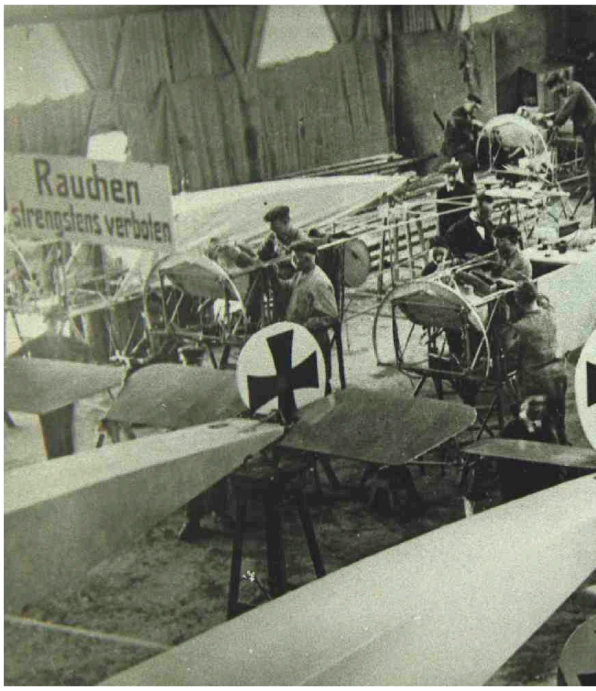
Germany's first purpose-built fighter; the Fokker Eindecker

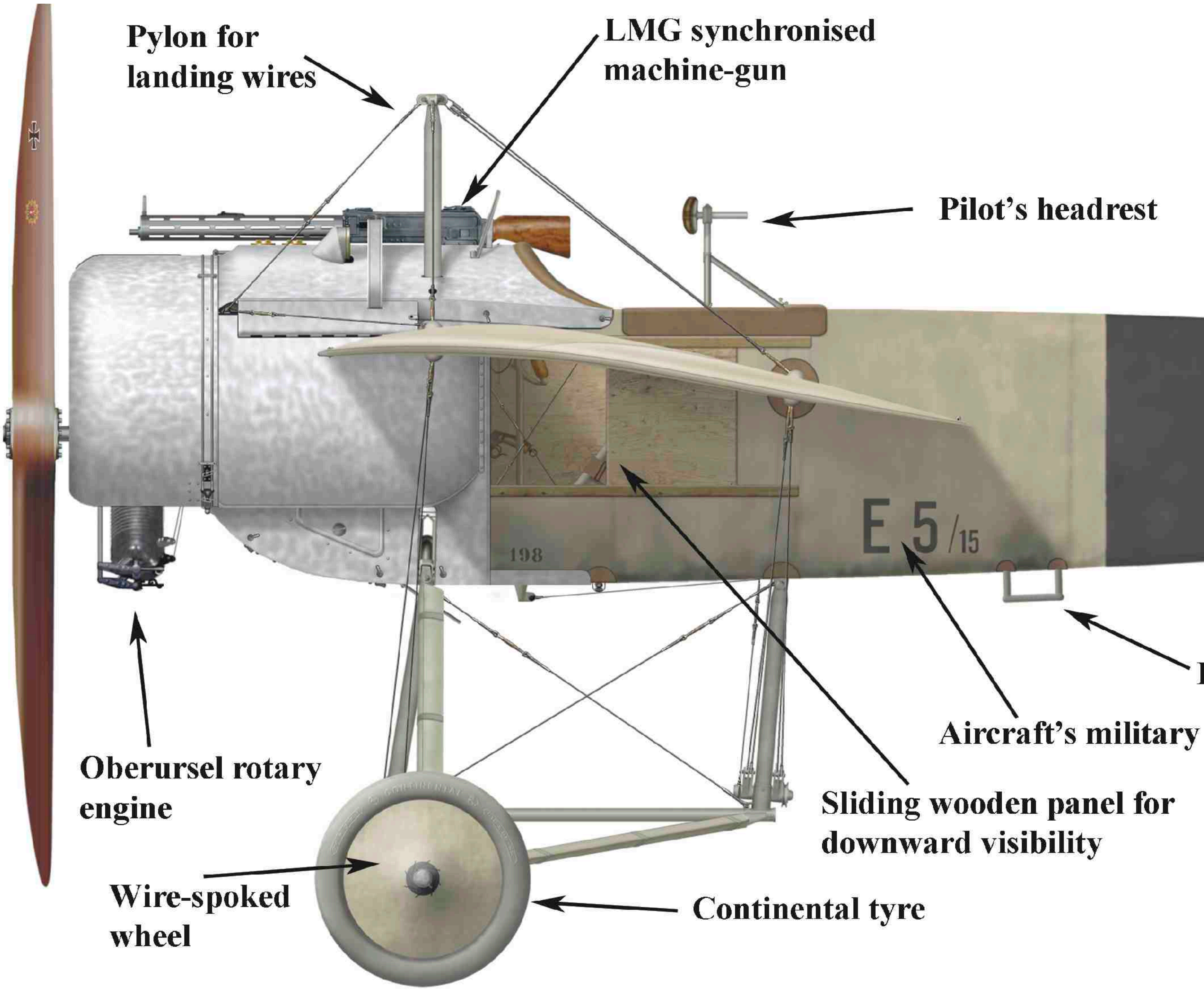
DESIGNED BY THE FAMOUS Dutch aviation pioneer, Anthony Fokker, the Eindecker series of single-seat fighters were the world's first military aircraft to be fitted with synchronisation gear. This basically enabled the pilot to fire his machine-gun directly through the propeller allowing him to literally point his aircraft at the enemy. The idea of firing bullets through the propeller was not a new one, but it was not until April 1915 that the concept fell into German hands when French aviator Roland Garros force landed his Morane-Saulnier Type L behind enemy lines. The Type L was fitted with Hotchkiss machine-gun that fired through the propeller which was protected by steel plates that deflected any round out of sequence. Fokker designed a more refined version that fired cleanly through the blades.

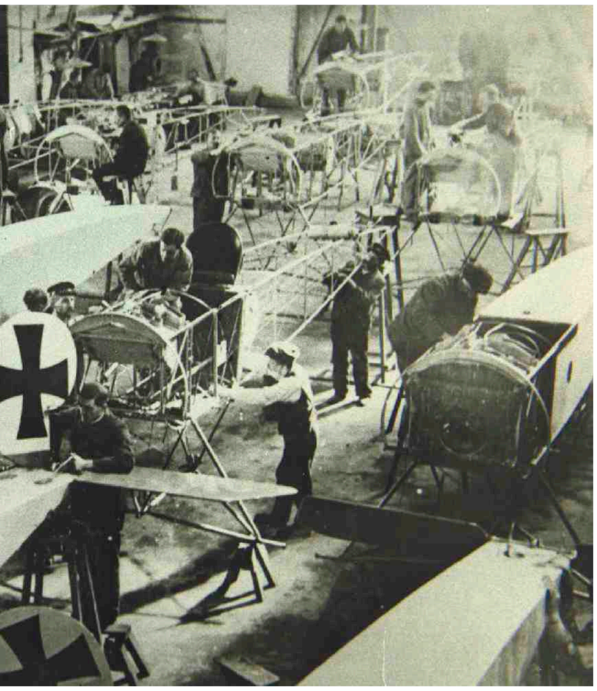
The synchronised system was first trialled on the Fokker M.5k/MG, the production version of this machine becoming the Fokker E.I (the 'E' standing for Eindecker). The braced-wing, single-seat E.I was replaced by E.II with more power and the definitive version, the E.III which featured a wing with a marginally narrower chord. Including the final less successful E.IV, production of the Eindecker series reached over 400 aircraft.

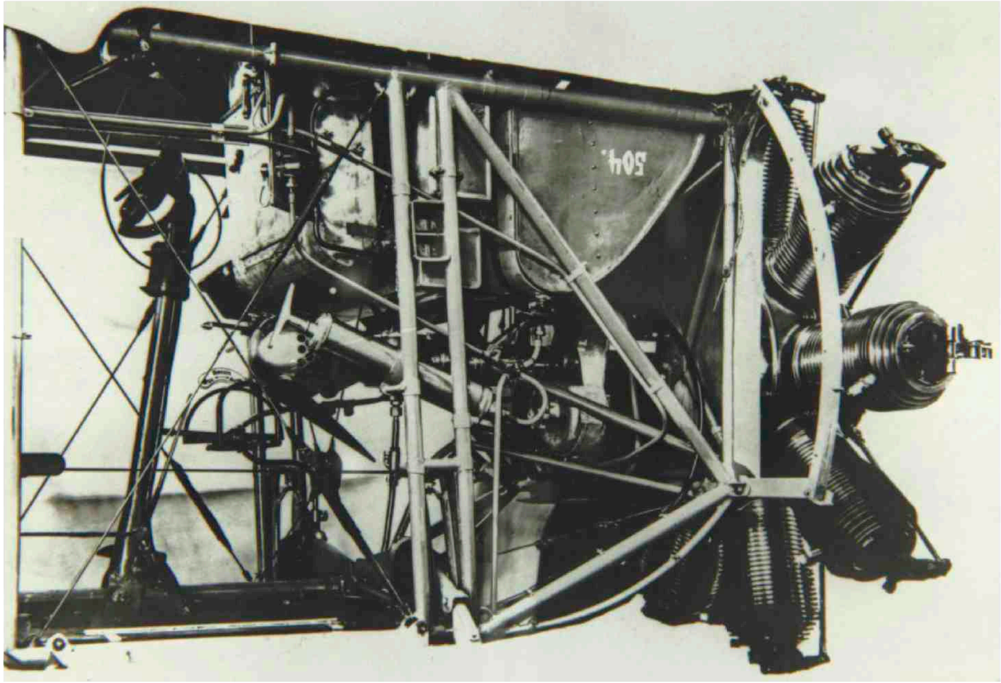
Infamously it was the Eindecker which coined the First World Phrase, the 'Fokker Scourge' that took place between the autumn of 1915 and the spring of 1916.

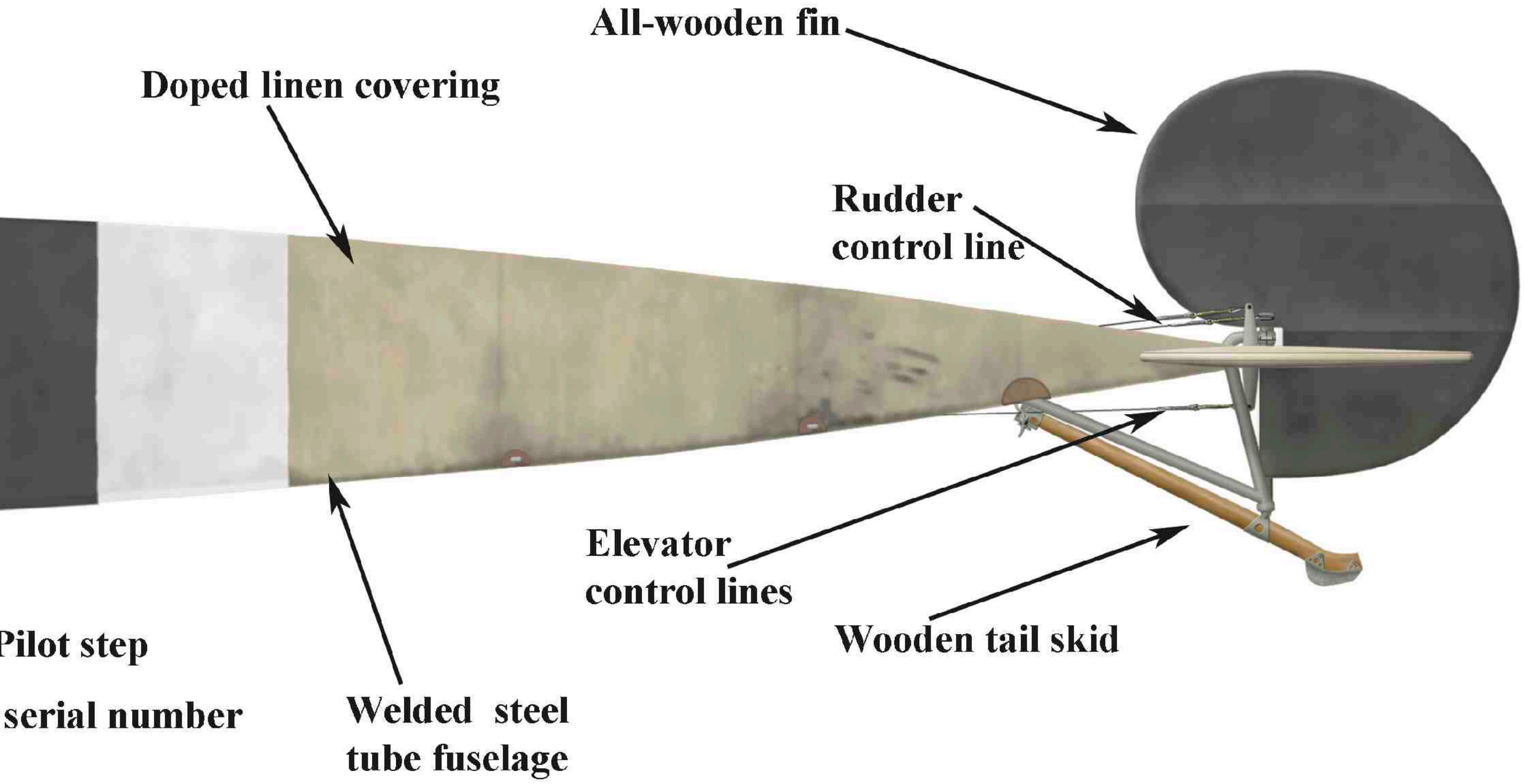



Rauchen
strengstens verboten


Pylon for landing wires
LMG synchronised machine-gun
Pilot's headrest
E 5/15
198
Aircraft's military
Oberursel rotary engine
Sliding wooden panel for downward visibility
Wire-spoked wheel
Continental tyre







Top left: In a scene reminiscent of how the Germans gained the technology to develop the synchronised machine gun in the first place, this E.III Eindecker had returned the favour and is clearly in French hands. Middle: Production of the Eindecker family was concentrated between 1915 and 1916 and all was carried out by Fokker-Flugzeugwerke. Production entailed 54 E.I, 49 E.II, 249 E.III and 49 E.IV making a grand total of 401 aircraft. Top right: Further detail of an exposed E.III airframe shows the position of the forward gravity fuel tank and the hand pump on the starboard side of the cockpit needed to supply the engine. The engine in this view is the 100hp Oberursel U.I nine-cylinder air-cooled rotary. Main: One of the most famous Eindecker's of all was Leutnant Kurt Wintgens E.I (aka an M.5k/MG), serialled E.5/15. Wintgens became the first pilot to shoot down an enemy aircraft using a fully synchronised machine-gun when he brought down a French Morane-Saulnier Type L on July 15, 1915. Prior to this historic victory, Wintgens had already brought down two other Type Ls but neither could be confirmed as they came down behind Allied lines.

Brothers in arms; the short-lived Voisin family of light bombers

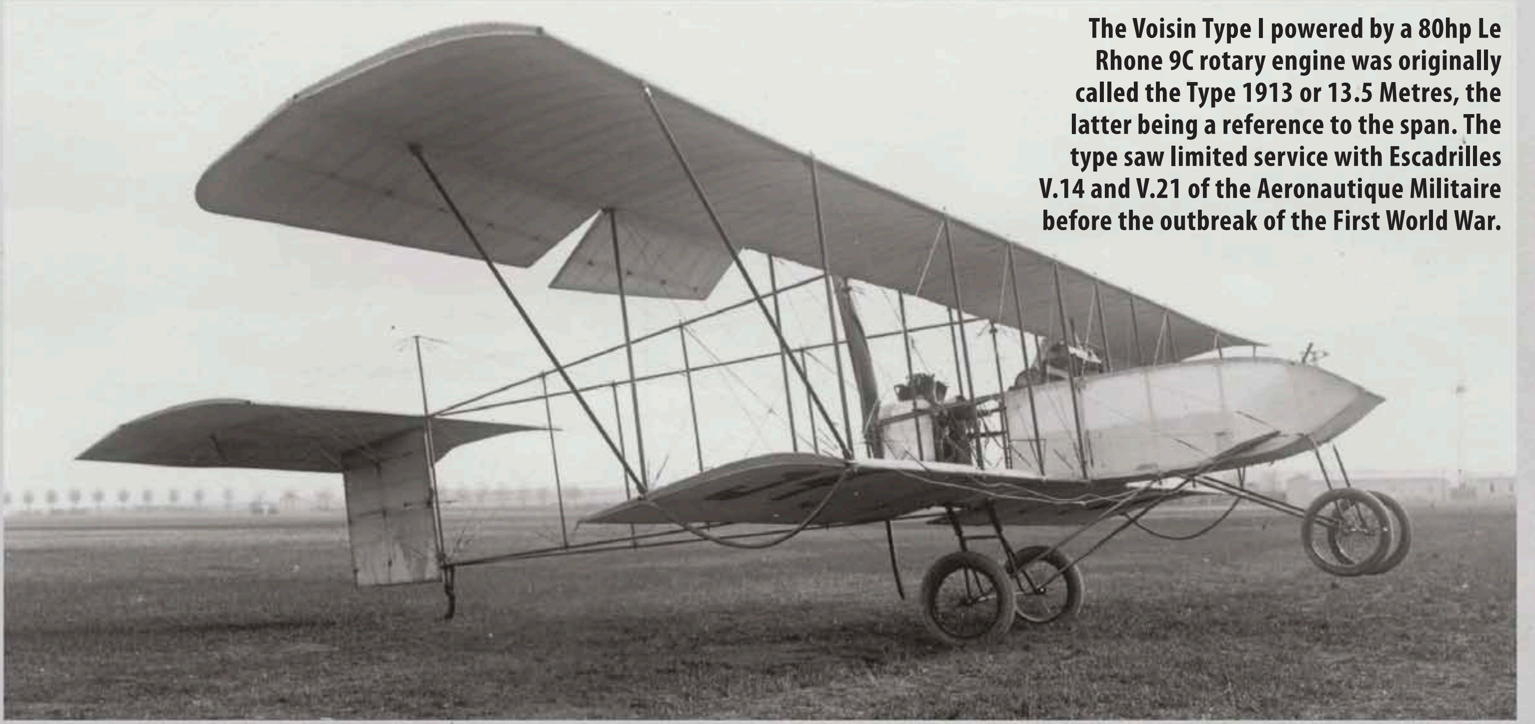
ESTABLISHED BY GABRIEL AND CHARLES VOISIN in 1906, the brothers formed Appareils d'Aviation Les Fréres Voisin in 1906. Gabriel had already gained aeronautical experience while working with Louis Bleriot who he bought out in November 1906 to form the new company.

The Voisins quickly established a new factory at Billancourt in the suburbs of Paris which effectively became the first commercial aviation factory in Europe. Initially building aircraft for customers, the first Voisin designed machine appeared in 1907 and the first military machine, simply called the Voisin Type Militaire arrived in 1910. The brothers continued to build a mix of racing and military aircraft culminating with Voisin Type L or Voisin Type I which won a French military order to the tune of 70 aircraft in 1912. Sadly Charles was killed in a car accident in 1912 and the company was renamed the Société Anonyme des Aéroplanes G. Voisin not long after.

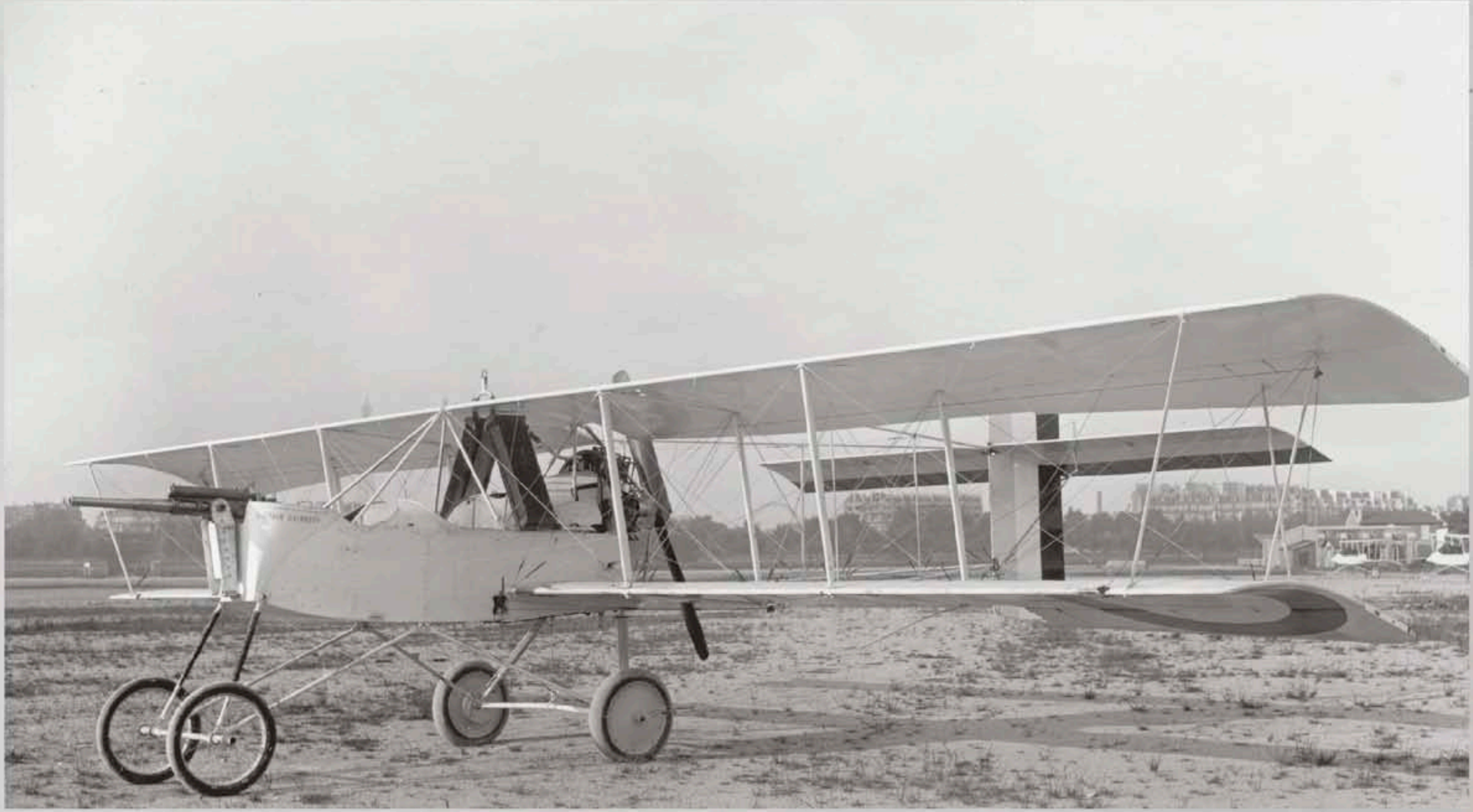
Undoubtedly Voisin's greatest success of the First World War came at the beginning, with the introduction of the Type III which quickly became the most common Allied bomber in theatre. Large numbers were built at Billancourt and under licence in Russia, Italy and Britain, the latter being carried out by the Savage Co.

The Type III achieved notoriety, when on October 5, 1914 Sgt J Frantz and Cpl L Quenault of Escadrille VB.24 scored the first air-to-air kill of the First World War when an Aviatik B.II was finished off with rifle fire. The type also became one of the first dedicated bombers over the Western Front, the aircraft being capable of carrying up to 330lb of bombs. Operating in daylight, losses began to mount for the Type III which was withdrawn in 1916 to make way for more advanced types including the Voisin Type V.

The Voisin brothers, Gabriel on the left and Charles on the right, established Voisin Aircraft in 1906 which would have made the company one of the earliest of its kind. Sadly, Charles was killed in a car accident in 1912 but Gabriel continued to run the company until 1918 when he returned to the car industry that he had originally left.



The Voisin Type I powered by a 80hp Le Rhone 9C rotary engine was originally called the Type 1913 or 13.5 Metres, the latter being a reference to the span. The type saw limited service with Escadrilles V.14 and V.21 of the Aeronautique Militaire before the outbreak of the First World War.



▲ **One of the most successful of all of the Voisin military aircraft was the Type III which became operational with the French Air Force from 1914 but was obsolete by the following year.**

▼ **The Voisin Type III was a great success, more than 800 being built at the main factory at Billancourt and many more under licence. The type served as a fighter and a bomber not only with the French Air Force, but also the Belgian, Italian, Romanian, Russian, Serbian, Ukrainian and in Britain with the RFC and RNAS.**

VOISIN V TECHNICAL INFORMATION

FIRST FLIGHT: 1915

ENGINE: One 150hp Canton-Unné or one 150hp Salmson M9

SPAN: 52ft 4.5in

LENGTH: 31ft 6.75in

MAX SPEED: 74mph

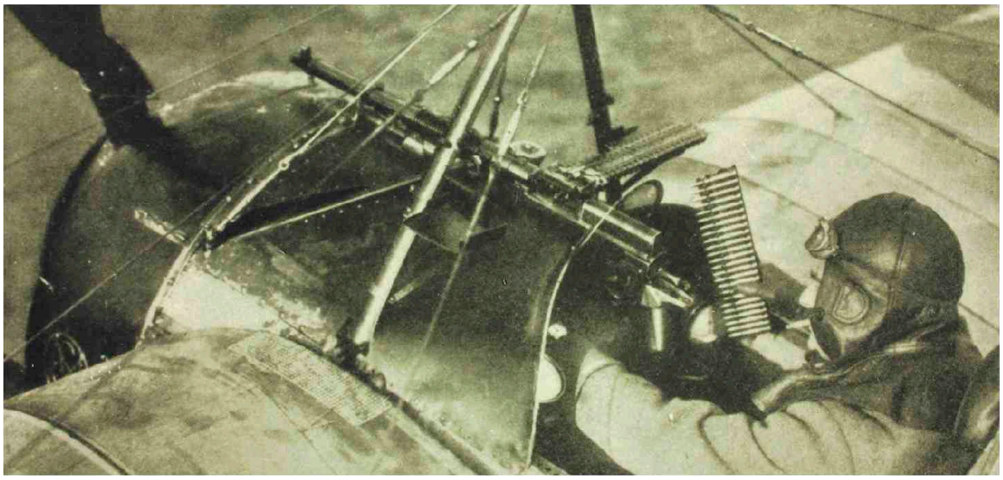
CREW: Two

The graceful, but challenging Morane-Saulnier Type N

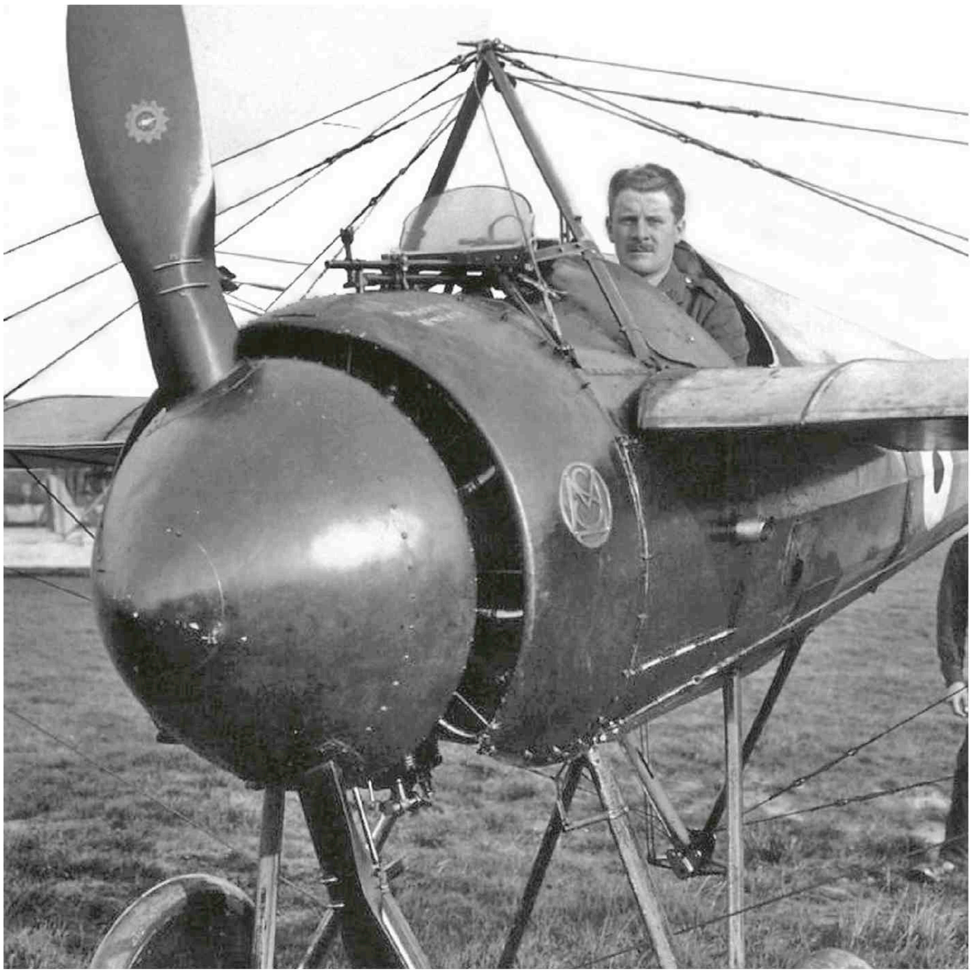
THE TYPE N FIRST APPEARED in public in the hands of Roland Garros in July 1914 at an aviation meeting at Aspern in Austria. A very attractive looking monoplane fighter, the Type N had a shoulder-wing and a circular fuselage which made it very aerodynamic. Following Garros being shot down in April 1915 the first Type N (designated MS.5C.1) to enter French Air Force service was named *Le Vengeur* (the *avenger*) and was flown by Eugéne Gilbert of Escadrille MS.23.

Known to the French as the Morane Monocoque and the British as the Morane Bullet the type not only served with the French Air Force, but also the RFC with 1, 3 and 60 Squadrons and with the 19th Squadron of the Imperial Russian Air Force.

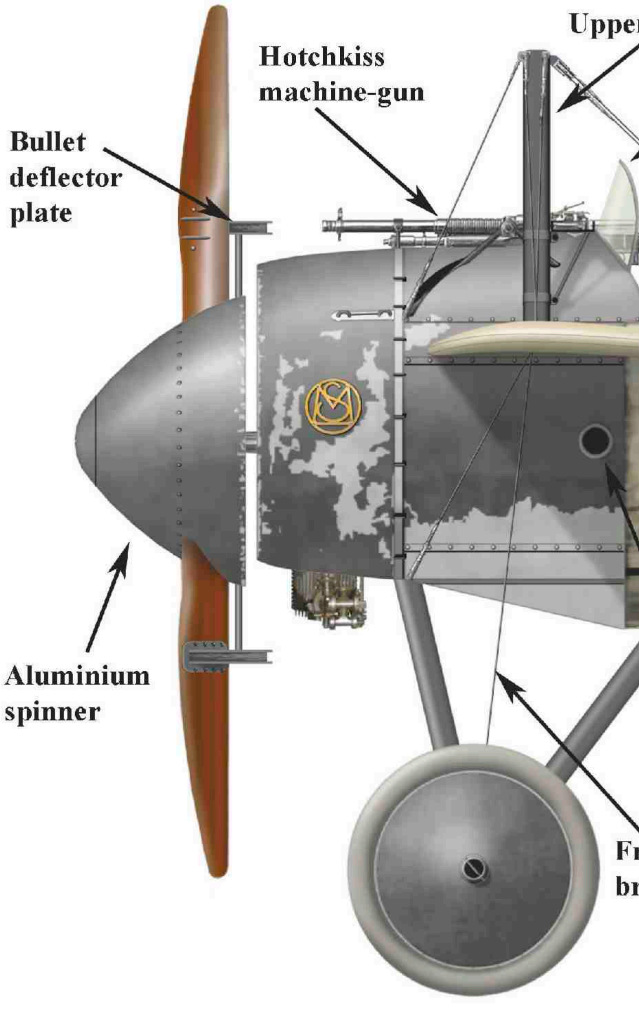
Only 49 Type Ns were built, the aircraft not being particularly successful in combat and it was quickly overtaken by the technology of the day.

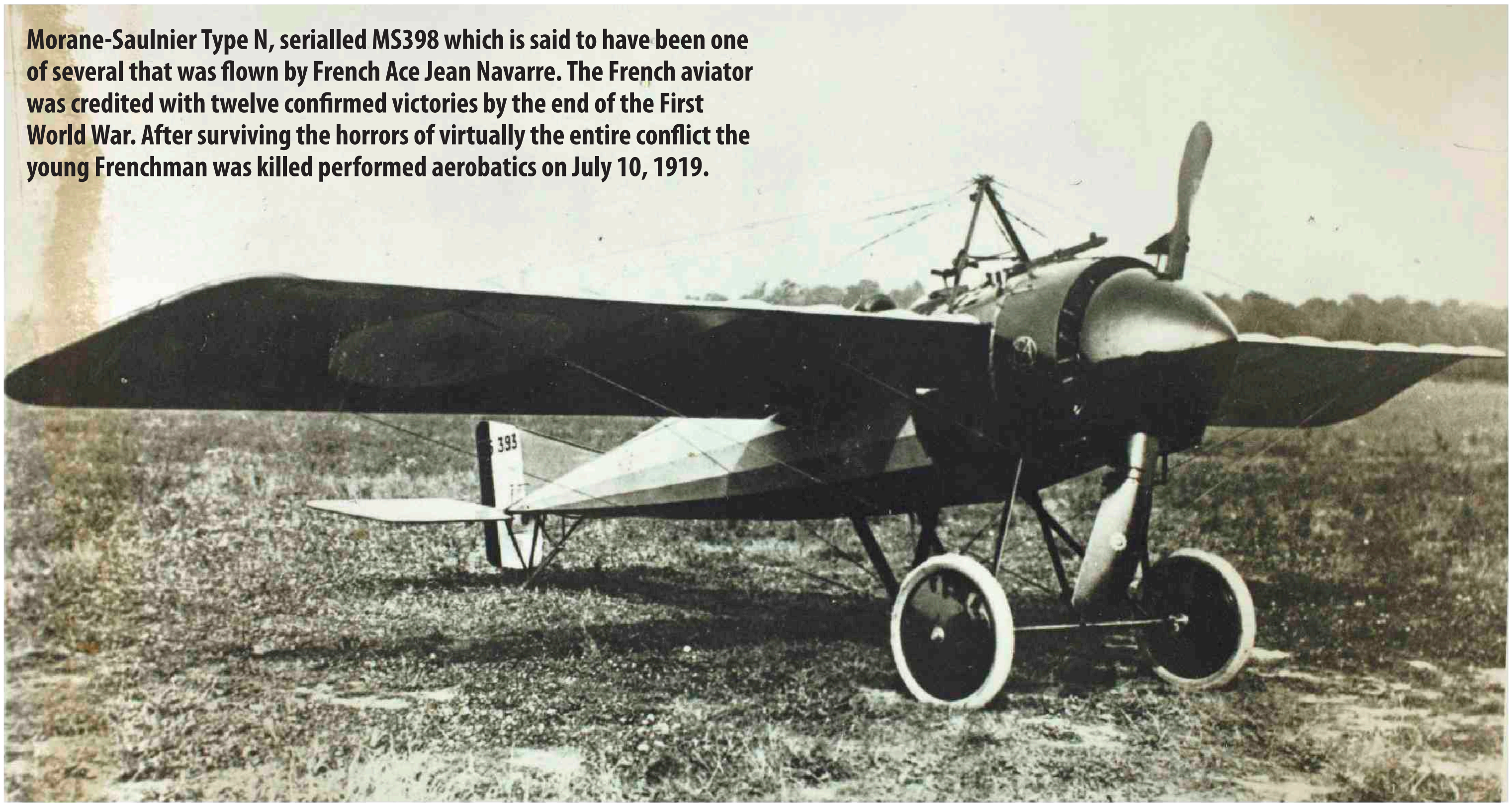


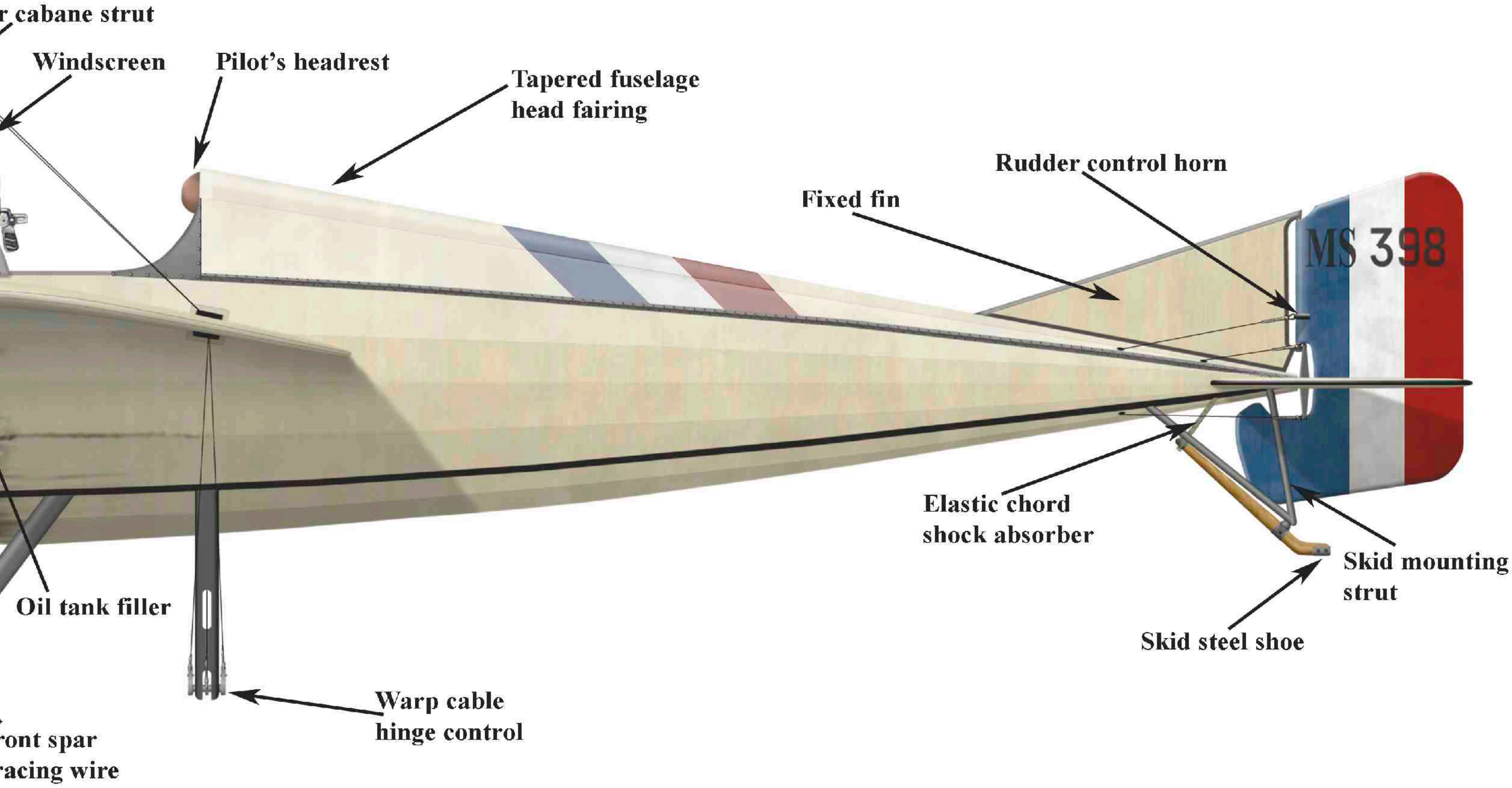
A French pilot demonstrates the straight forward re-loading procedure for the 0.315in (8mm) Hotchkiss machine gun as fitted to a Type N. The pilot is pictured holding a spare 24-round clip which was dispensed fairly rapidly, as the weapon had a rate of fire of 450 rounds per minute.



An RFC pilot tries a Morane-Saulnier Type N 'Bullet' for size which probably belongs to either 1 (October 1915 to March 1916), 3 (October 1915 to July 1916) or 60 Squadron (May 1916 to September 1916). The large 'casserole' metal spinner which conceals the Le Rhone rotary would have been an attempt to keep the fighter as aerodynamically clean as possible.




Morane-Saulnier Type N, serialled MS398 which is said to have been one of several that was flown by French Ace Jean Navarre. The French aviator was credited with twelve confirmed victories by the end of the First World War. After surviving the horrors of virtually the entire conflict the young Frenchman was killed performed aerobatics on July 10, 1919.



TYPE N TECHNICAL INFORMATION

FIRST FLIGHT: July 1914 **ENGINE:** One 80hp Le Rhône 9C **SPAN:** 26ft 8.75in **LENGTH:** 9ft 1.5in
MAX SPEED: 90mph **CREW:** One **ARMAMENT:** One .303in Vickers machine-gun or one 0.315in Hotchkiss machine-gun

Enter Germany's first 'battle squadrons': the AEG Type Gs

GERMANY WAS THE FIRST to recognise the potential of operating bomber squadrons in large numbers over the Western Front from early 1915. Later that year AEG (Allgemeine Elektricitäts-Gesellschaft) responded by constructing the G.I which was woefully under-powered and only one example was built.

The G.II followed suit with more powerful engines and the ability to carry up to 441lb of bombs. However only 15 were built before it was superseded by the G.III which continued to raise the performance bar, but once again only limited numbers were produced. By late 1916 the definitive model, the G.IV had arrived with more adequate 260hp Mercedes D.IVa inline piston engines which allowed for a fourth crew member compared to the previous aircraft's crew of three. Each crew position was interconnected. The G.IV was capable of carrying a healthy maximum bomb of 882lb but this would be to the detriment of range and this amount was very rarely carried operationally. This restricted the G.IV to short-range tactical operations but the aircraft's overall effectiveness was very good.

The most prolific of all the G series types, approximately 320 G.IVs were built between 1916 and 1918. Never fully superseded, a G.IVb and G.IVK variant was produced, the former featuring an increased span three-bay wing while the latter was fitted with a 0.79in (2cm) Becker cannon in the nose. The AEG G.V came too late to serve during the war but several did operate as airliners for Deutsche Luftreederie in 1919.

AEG G.IV TECHNICAL INFORMATION

FIRST FLIGHT: 1916

ENGINE: Two 260hp Mercedes D.IVa

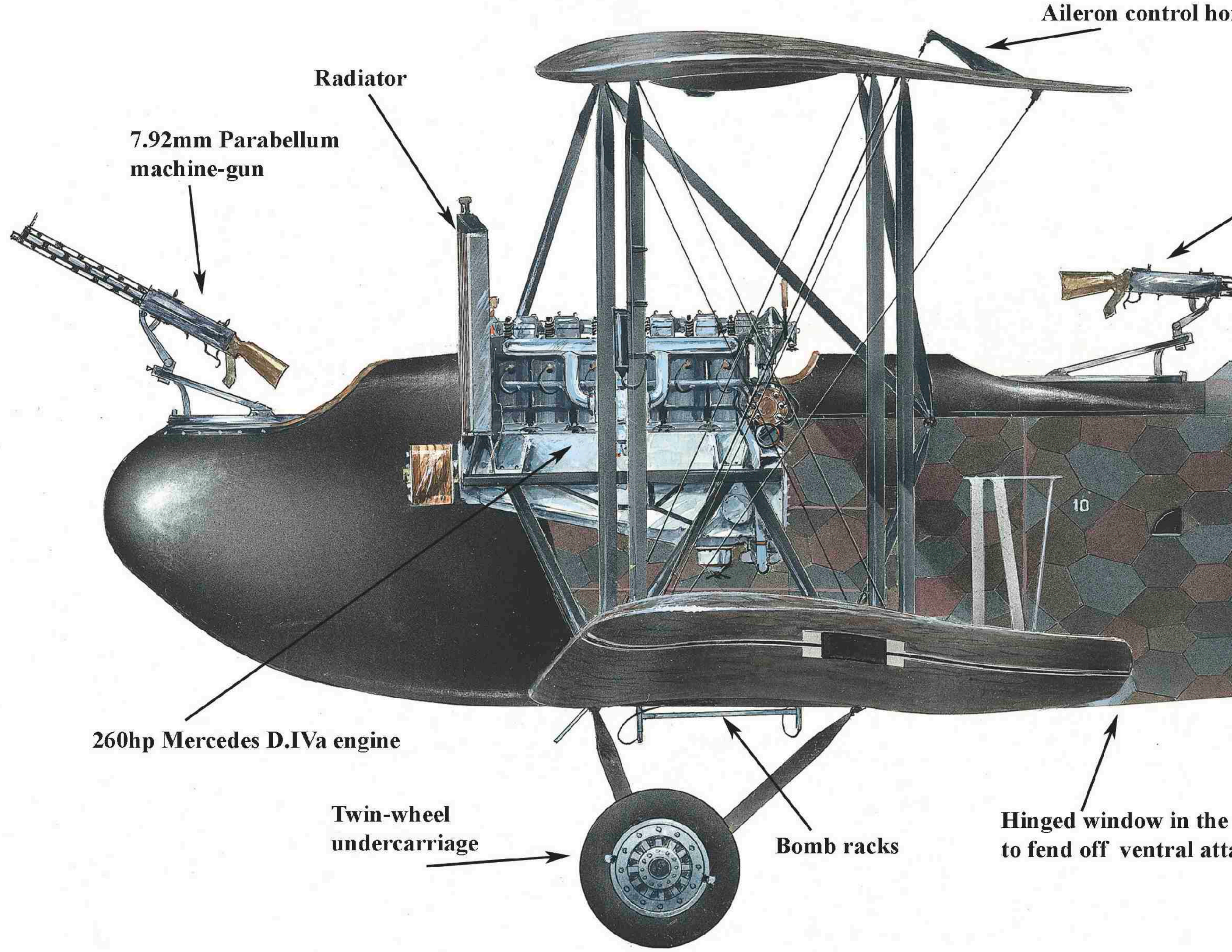
SPAN: 60ft 4.5in

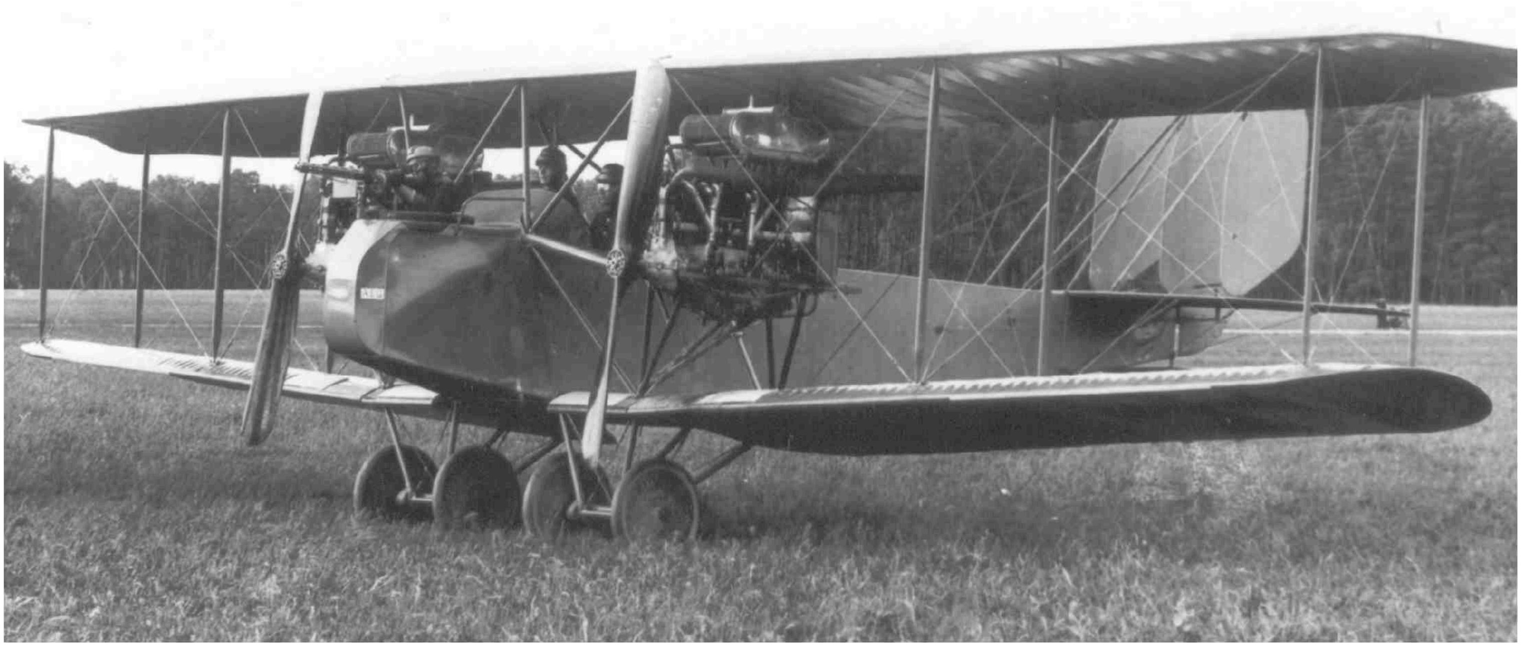
LENGTH: 31ft 9.75in

MAX LEVEL SPEED: 103mph

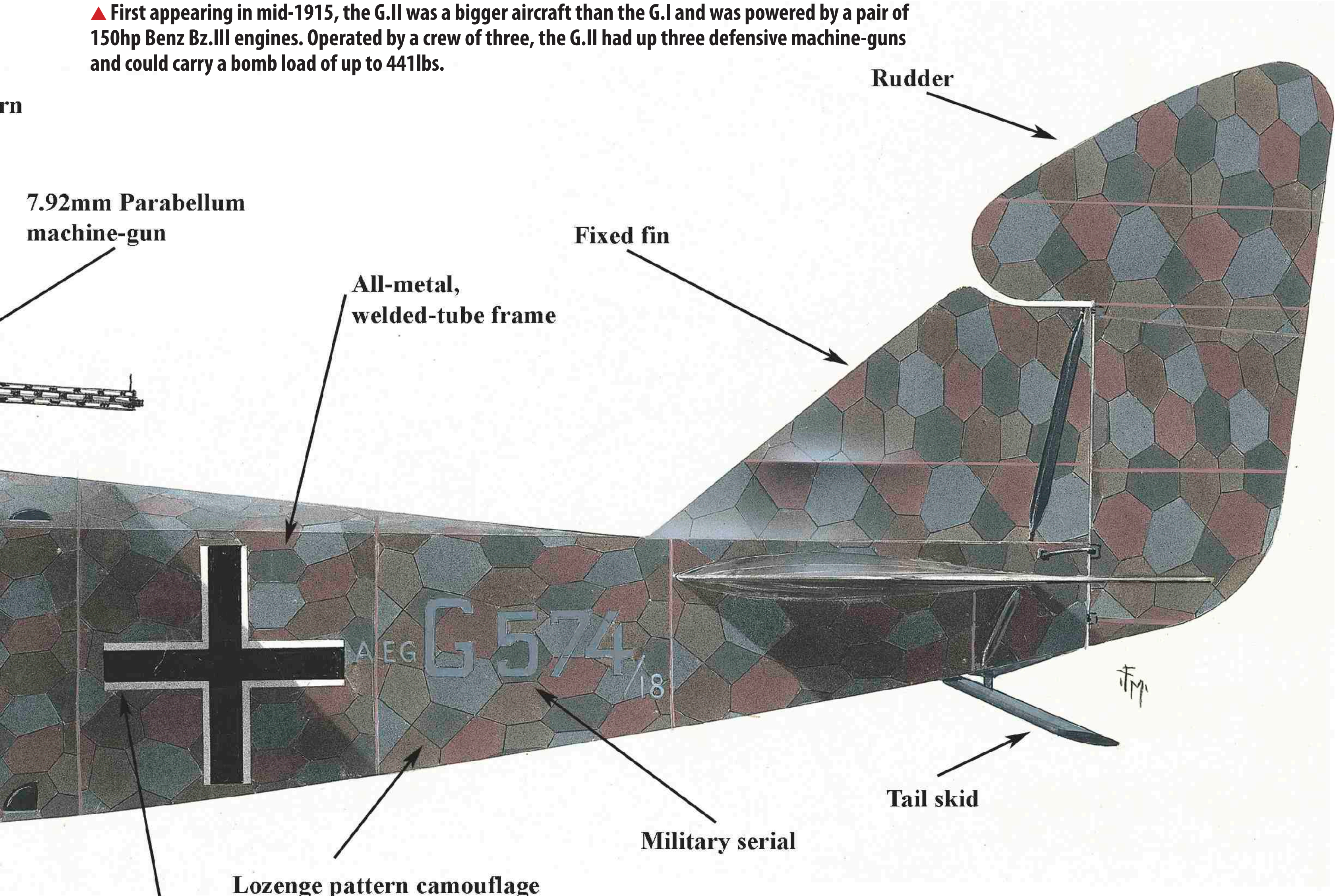
CREW: Three to Four

ARMAMENT: Two 0.31in (7.92mm) Parabellum machine-guns and a maximum bomb load of 882lb





▲ First appearing in mid-1915, the G.II was a bigger aircraft than the G.I and was powered by a pair of 150hp Benz Bz.III engines. Operated by a crew of three, the G.II had up three defensive machine-guns and could carry a bomb load of up to 441lbs.


Rudder
rn
7.92mm Parabellum machine-gun
Fixed fin
All-metal, welded-tube frame
AEG G 574/18
Tail skid
Military serial
Lozenge pattern camouflage
floor
ack
German National marking from March 20, 1918

▲The definitive member of the AEG Type G series was the IV, of which approximately 320 examples were built between 1916 and the end of the First World War.

Italy's outstanding premier bomber; the Caproni Ca.3

THE CAPRONI STORY began in 1908 when Count Gianni Caproni founded one of Italy's most influential aircraft manufacturers. After cutting his teeth on some early designs, Caproni hit the ground running with the introduction of the prototype Ca.30 which first flew in October 1914. The bomber incorporated a large number of novel design features including the general layout which consisted of a central crew nacelle and twin tail booms fitted with a triple-fin tail unit. Power was provided by three engines, two mounted in tractor positions between the mainplanes and a third mounted at the rear of the central nacelle.

Once the type had reached the production stage the aircraft was designated as the Ca.31 but was built as the Ca.1, with power provided by a trio of 100hp Fiat engines. Only twelve were ordered at first but this quickly grew to 150 as the war progressed. The Ca.2 followed with the rear engine being replaced with a 150hp V.4b, but after only nine were built all attention was paid to the definitive Ca.3 which was re-engined completely with the powerful and reliable Isotta-Fraschini power plant. 299 Ca.3s were built between 1917 to 1919 by Caproni and under licence by the French company, Robert Esnault-Pelterie, who built a further 82 examples. Post-war, a structurally improved version designated as the Ca.3M was built between 1923 and 1926.

CAPRONI CA.3 TECHNICAL INFORMATION

FIRST FLIGHT: 1916

ENGINE: Three 150hp Isotta-Fraschini V.4B

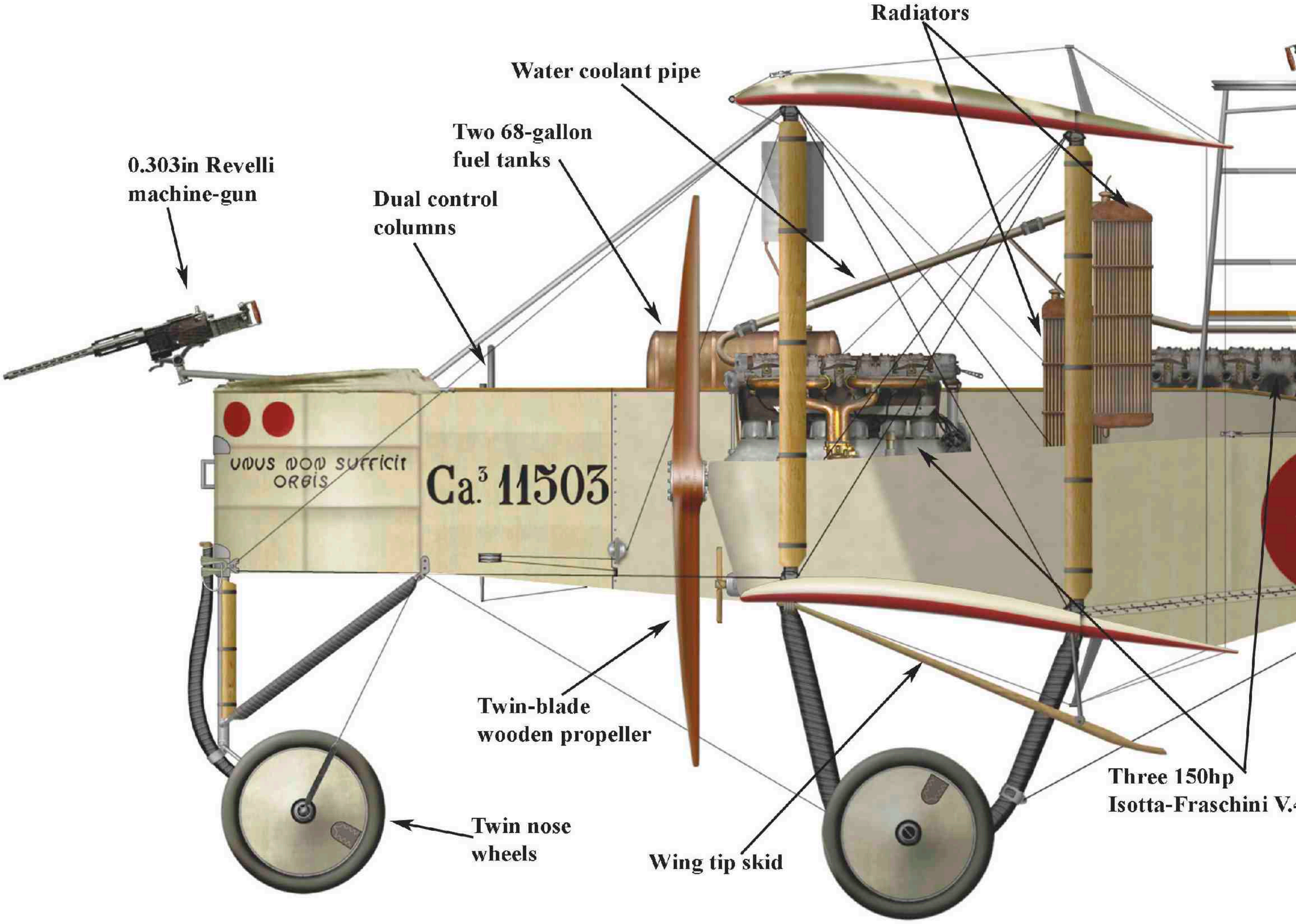
SPAN: 72ft 10in

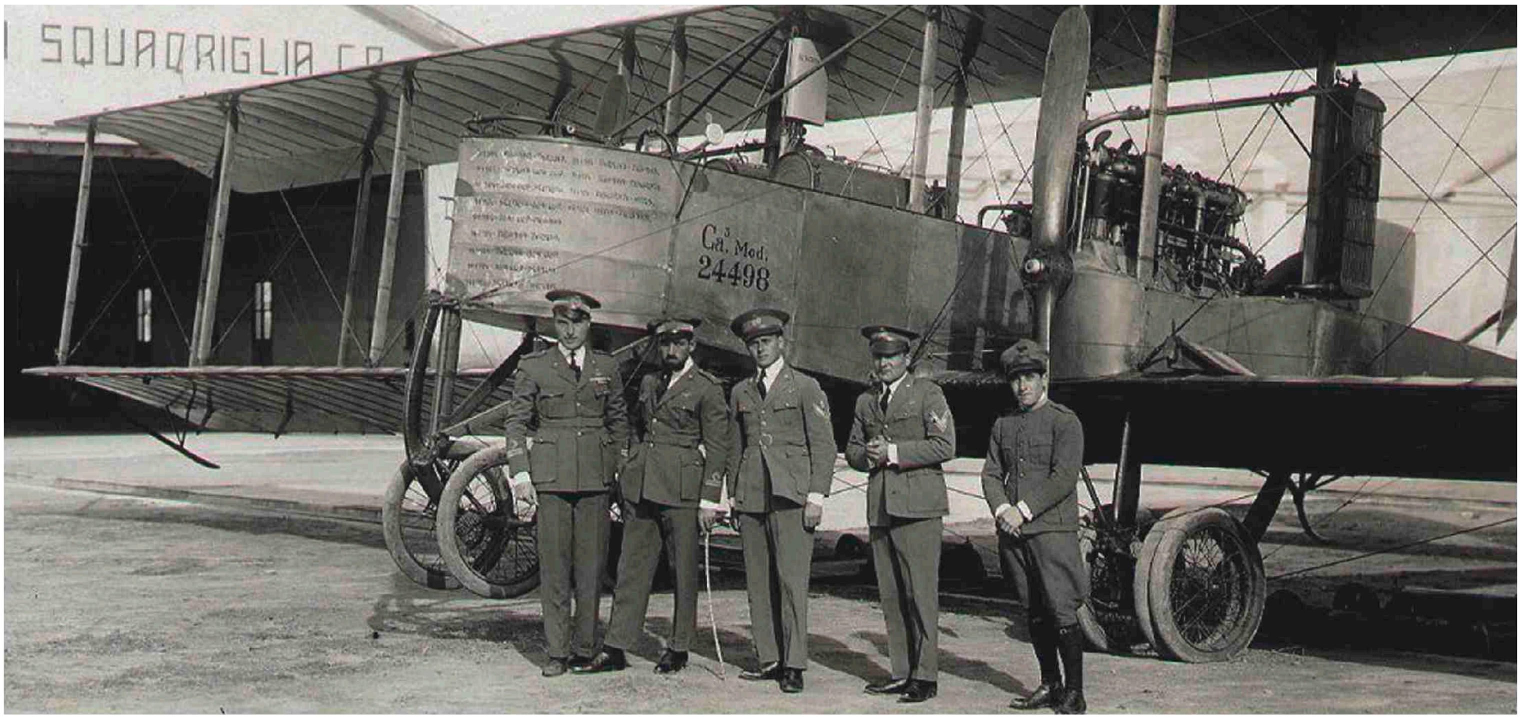
LENGTH: 35ft 9.25in

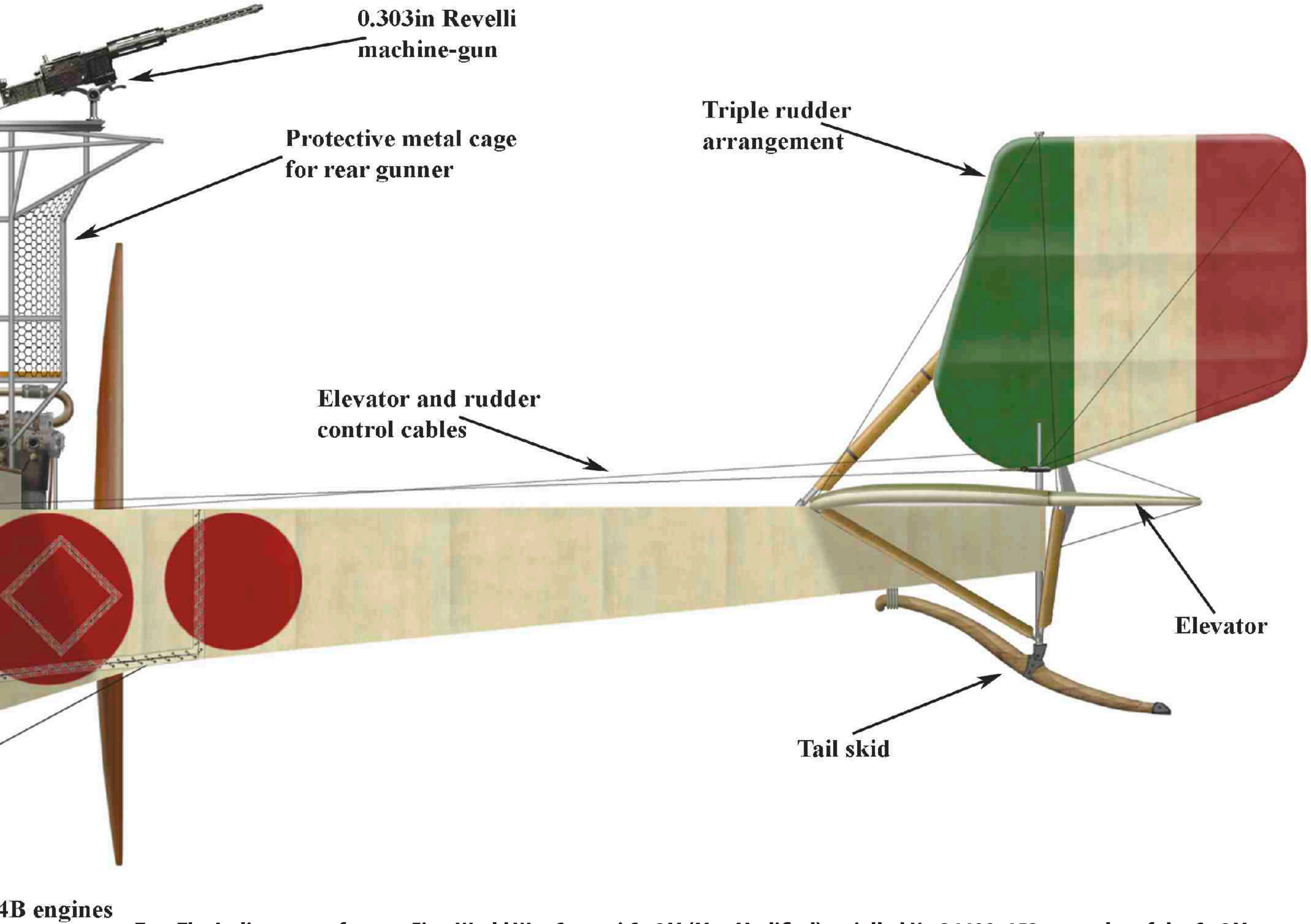
MAX SPEED: 87mph

CREW: Four (Pilot, co-pilot, front gunner & rear gunner/engineer)

ARMAMENT: Two or four 0.303in (7.7mm) Revelli machine-guns and a bomb load of 992lb






0.303in Revelli machine-gun
Protective metal cage for rear gunner
Triple rudder arrangement
Elevator and rudder control cables
Elevator
Tail skid
4B engines

Top: The Italian crew of a post-First World War Caproni Ca.3M (M = Modified) serialled No.24498. 153 examples of the Ca.3M were manufactured between 1923 and 1926. Main: The Ca.3 was a remarkable aircraft which saw continuous service throughout the First World War and beyond into the late 1920s. The functional design gave protection to the crew and performance was respectable for the day with a maximum speed of 87mph, a ceiling of 13,450ft and a range of 280 miles. This aircraft, Ca.3, No.11503 has 'Unus Non Sufficit Orbis' applied to outside of the front gunner's position which translates from Latin to 'One of the world is not enough'.

Titled 'Pioneer Sky' this dramatic artwork is of a Caproni Ca.3 operating from Northern Italy over the Alps in 1916. Defensive armament varied but in this image the front gunner is clearly opening up with a pair of .303in Revelli machine-guns while the caged position (to protect the crew from the pusher propeller), which is unattended also contains a pair of Revelli machine-guns. ***Rado Javor***

Ca 3 4164
..!..

René and Gaston's long-serving Caudron G.3

BY THE TIME the G.3 (or G.III) appeared in May 1914, René and Gaston Caudron had designed over 20 different aircraft and built more than 150 machines since entering into the aviation industry five years earlier.

The G.3 was initially built at Rue and then test flown from Le Crotoy on the Picardie coast where the Caudron's had already established a flying school. Distinctive because of the aircraft's short crew nacelle, twin booms and sesquiplane layout, the G.3 first entered military service with Escadrille C.11 of the French Aviation Militaire, based at Montmédy before the First World War broke out.

The G.3 was a huge success for the company which resulted in a total wartime production in France of 2,450 aircraft. Caudron alone built 1,423 while the remainder was sub-contracted to other French manufacturers to keep pace with demand. 233 were built in Britain by the Caudron Co. and a further 166 were constructed by the A.E.R. Co. of Orbassano located near Turin in Italy.

The G.3 mainly served as an unarmed reconnaissance aircraft, a role it maintained operational until 1917 by which time it was heavily employed as trainers; a task that continued into the post-war period.

CAUDRON G.3 TECHNICAL INFORMATION

FIRST FLIGHT: May 1914

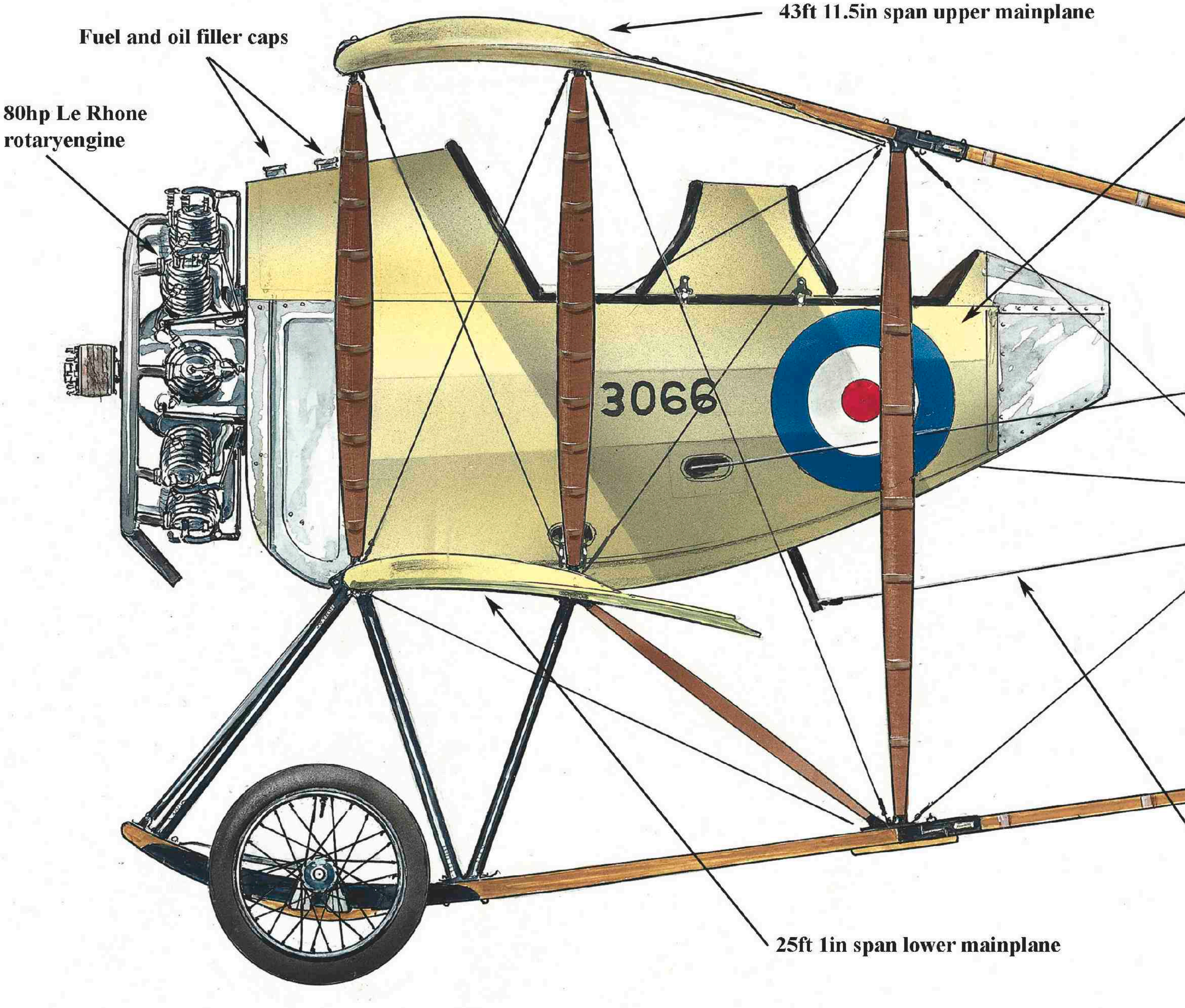
ENGINE: One 80hp Le Rhône

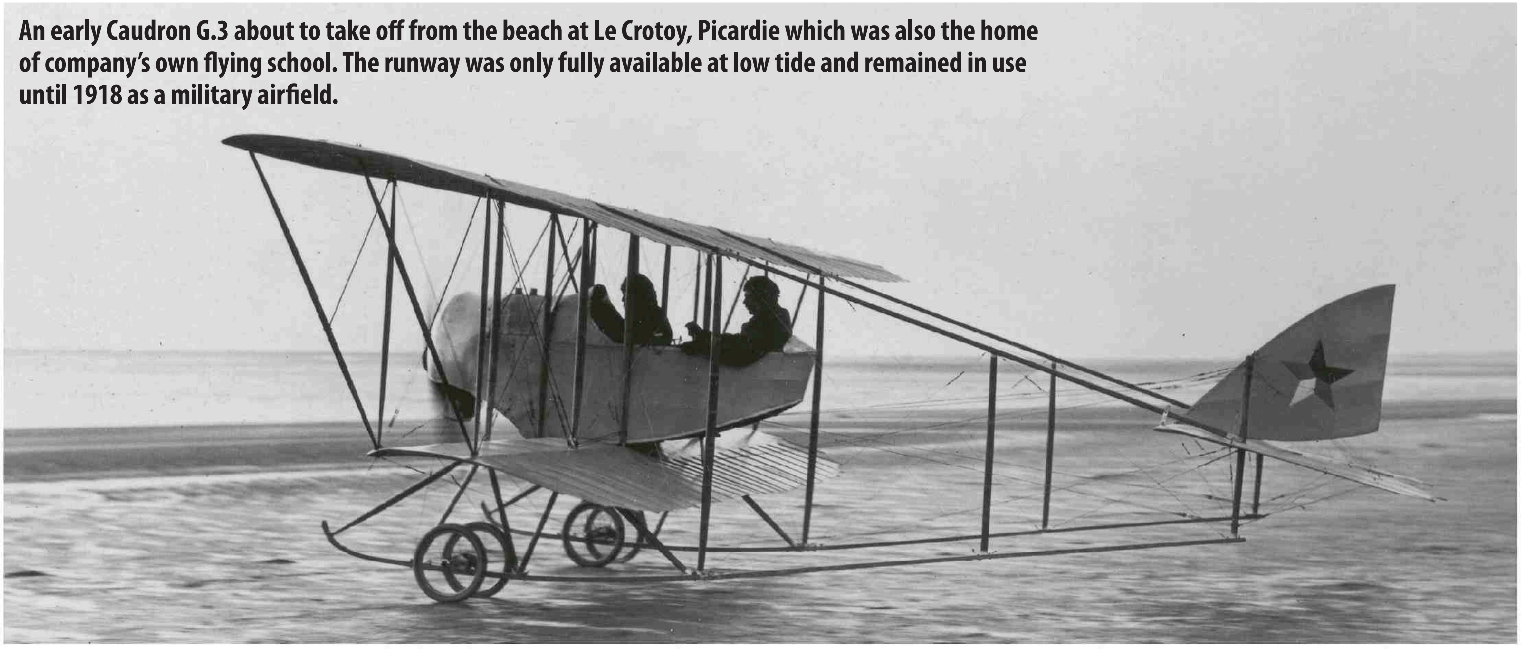
SPAN: 43ft 11.5in

LENGTH: 21ft

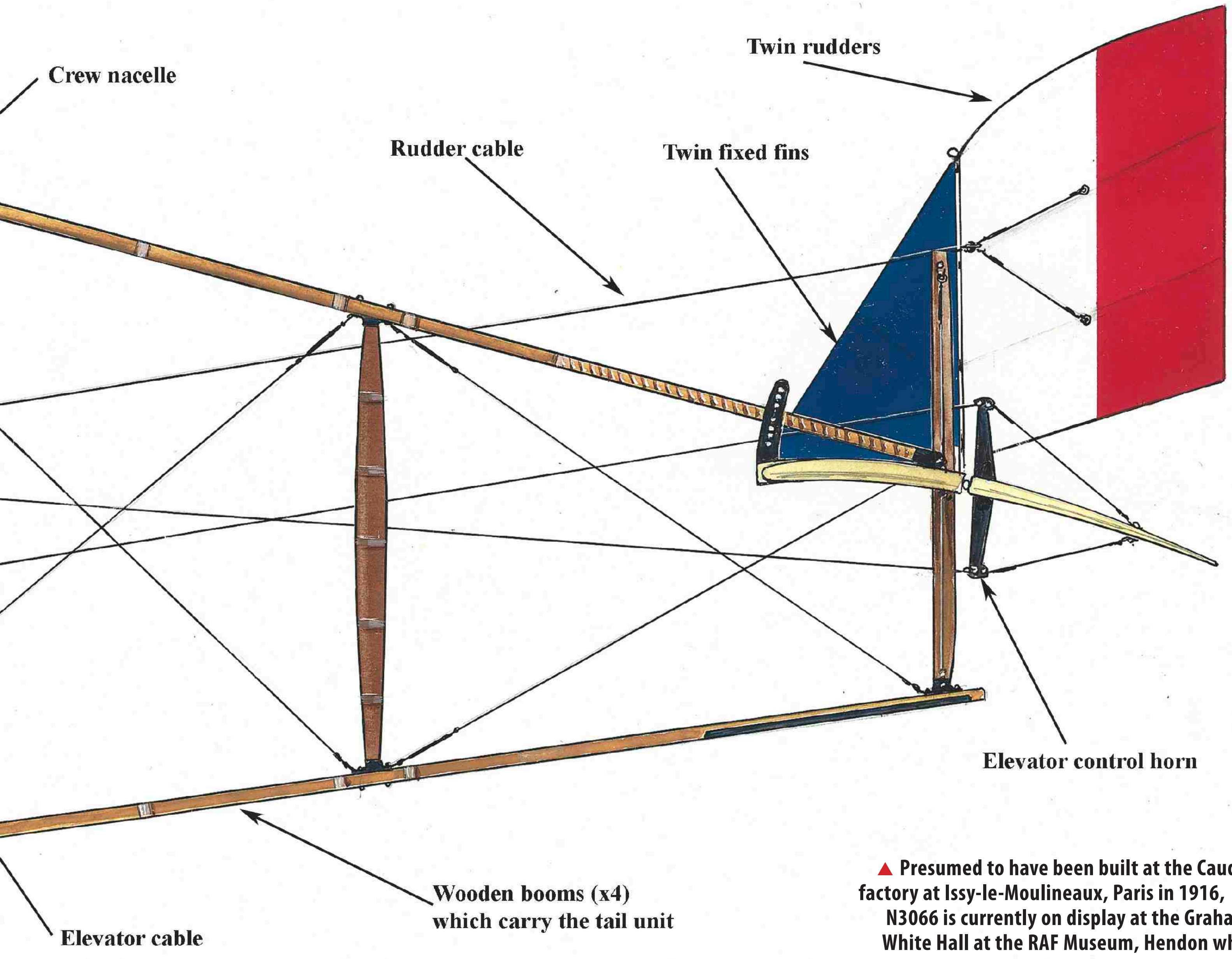
MAX SPEED: 67mph

CREW: Two


43ft 11.5in span upper mainplane
Fuel and oil filler caps
80hp Le Rhone rotaryengine
3066
25ft 1in span lower mainplane



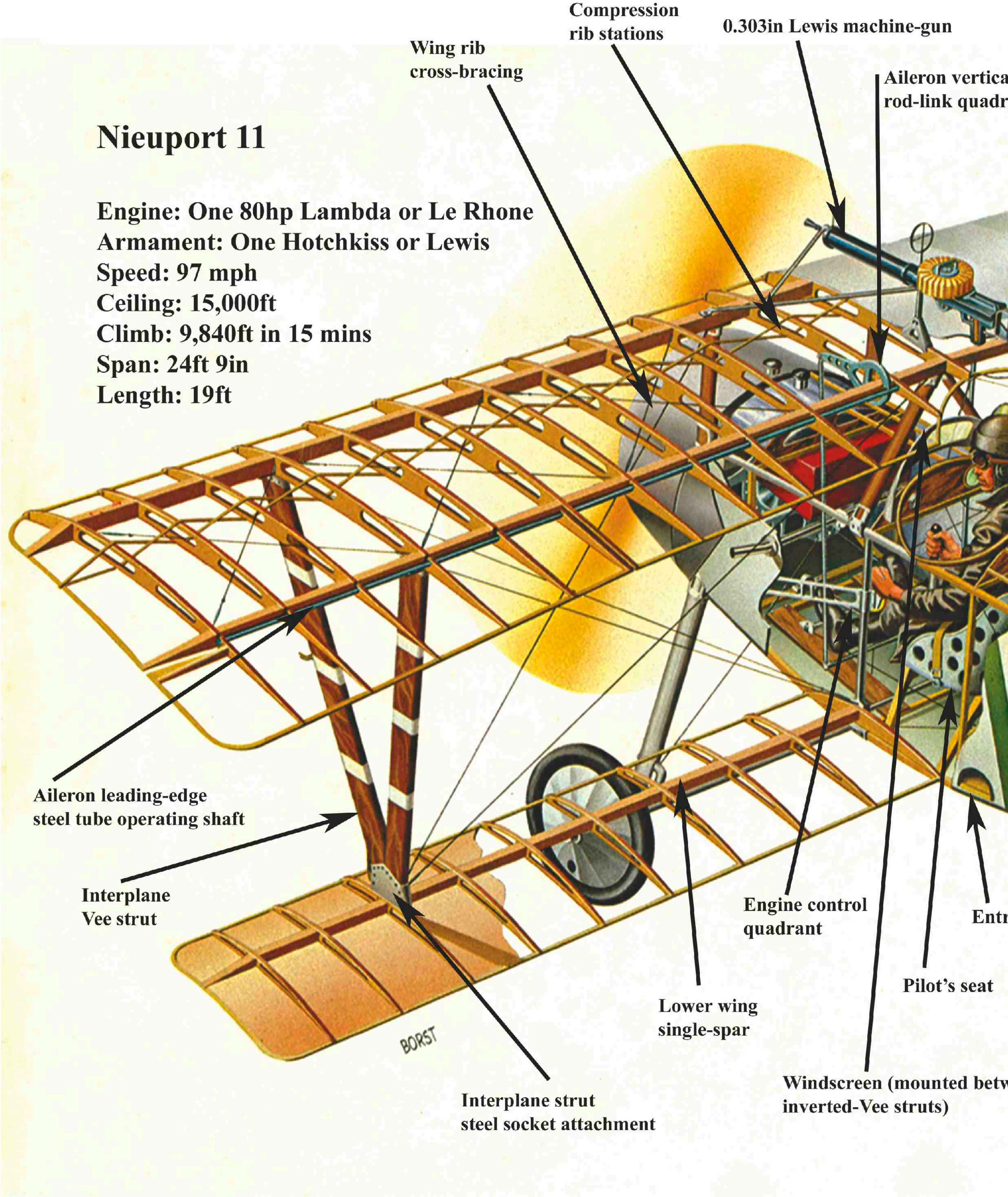
An early Caudron G.3 about to take off from the beach at Le Crotoy, Picardie which was also the home of company's own flying school. The runway was only fully available at low tide and remained in use until 1918 as a military airfield.

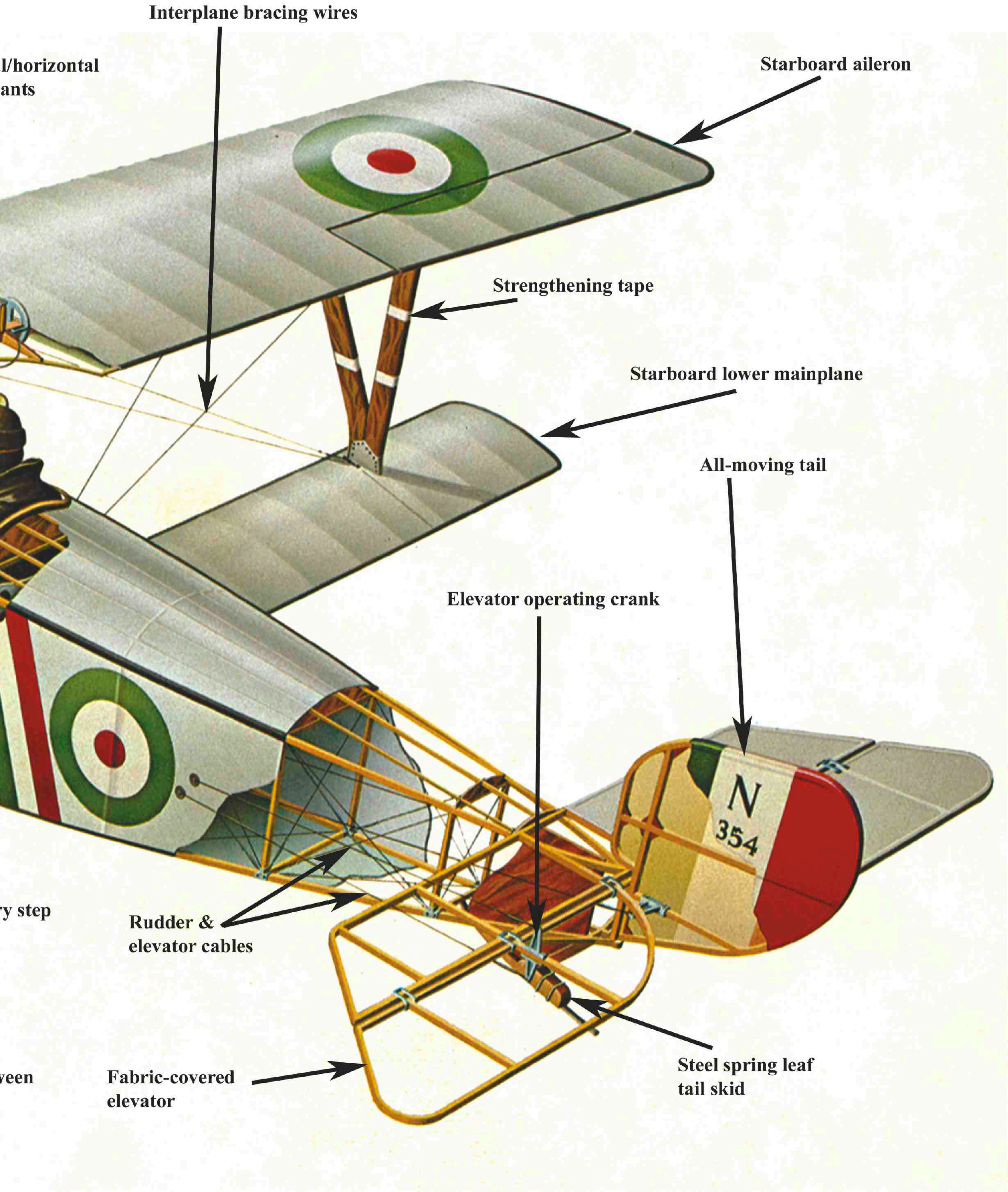


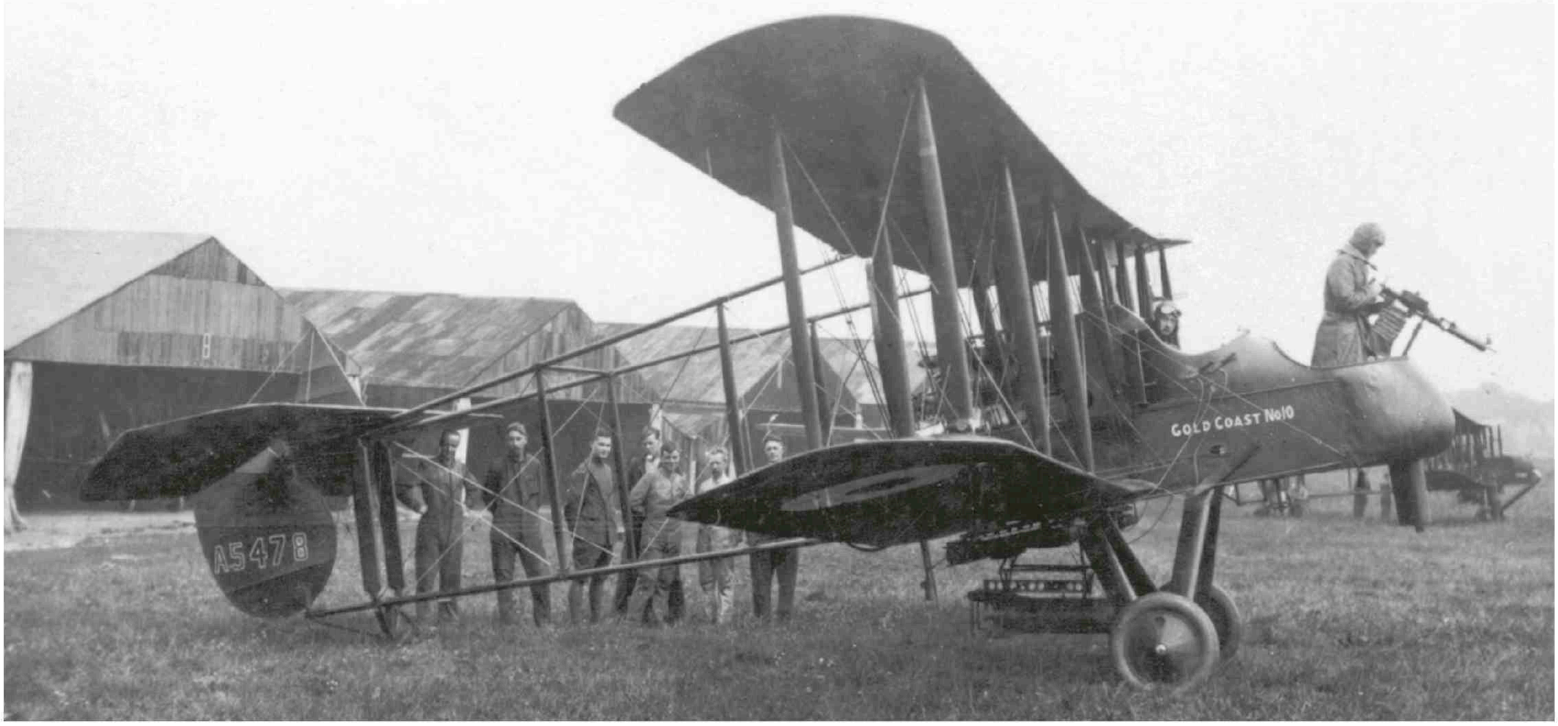
▲ Presumed to have been built at the Caudron factory at Issy-le-Moulineaux, Paris in 1916, G.3, N3066 is currently on display at the Grahame-White Hall at the RAF Museum, Hendon whose care it has been under since 1972.

Nieuport 11

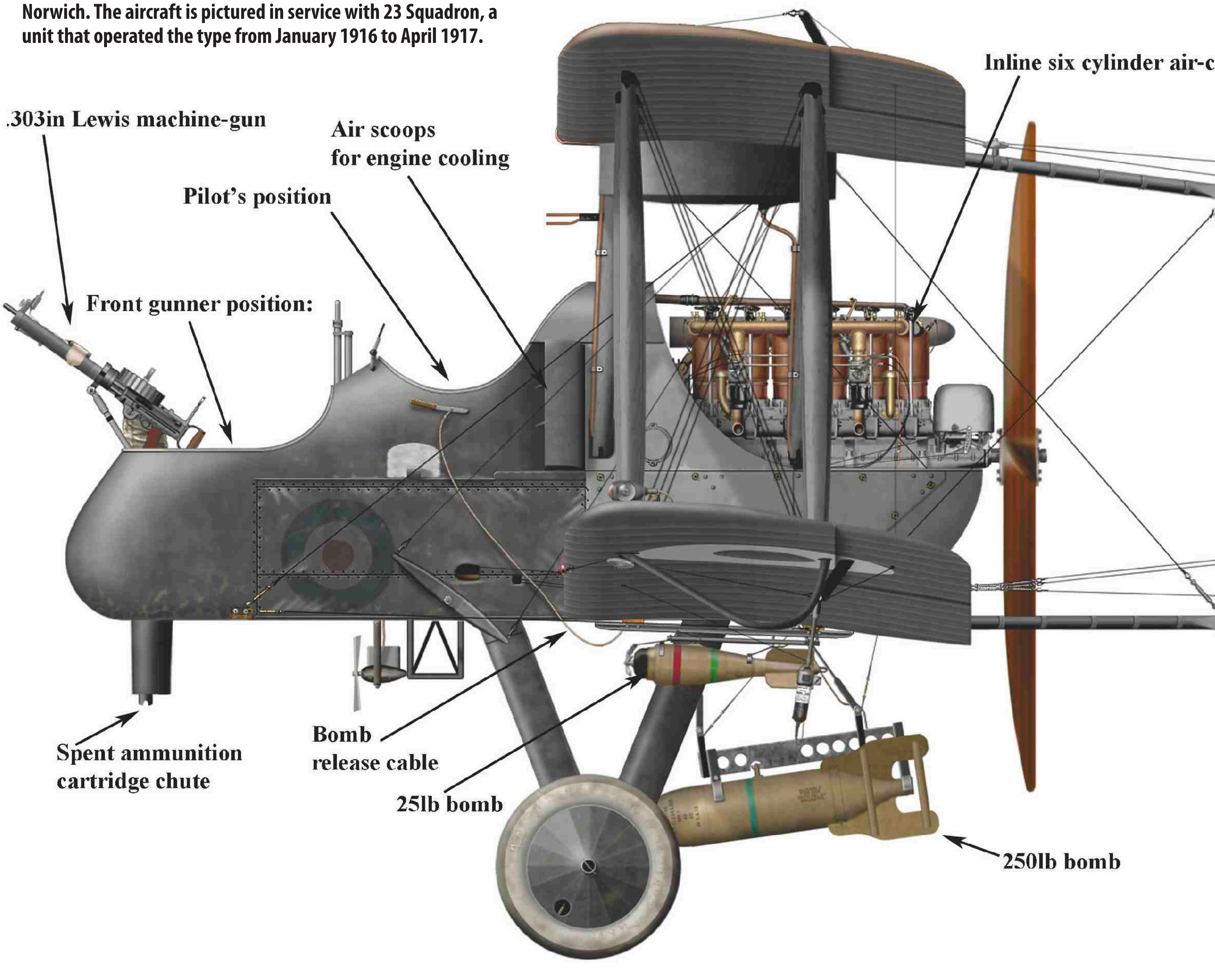
Engine: One 80hp Lambda or Le Rhone
Armament: One Hotchkiss or Lewis
Speed: 97 mph
Ceiling: 15,000ft
Climb: 9,840ft in 15 mins
Span: 24ft 9in
Length: 19ft

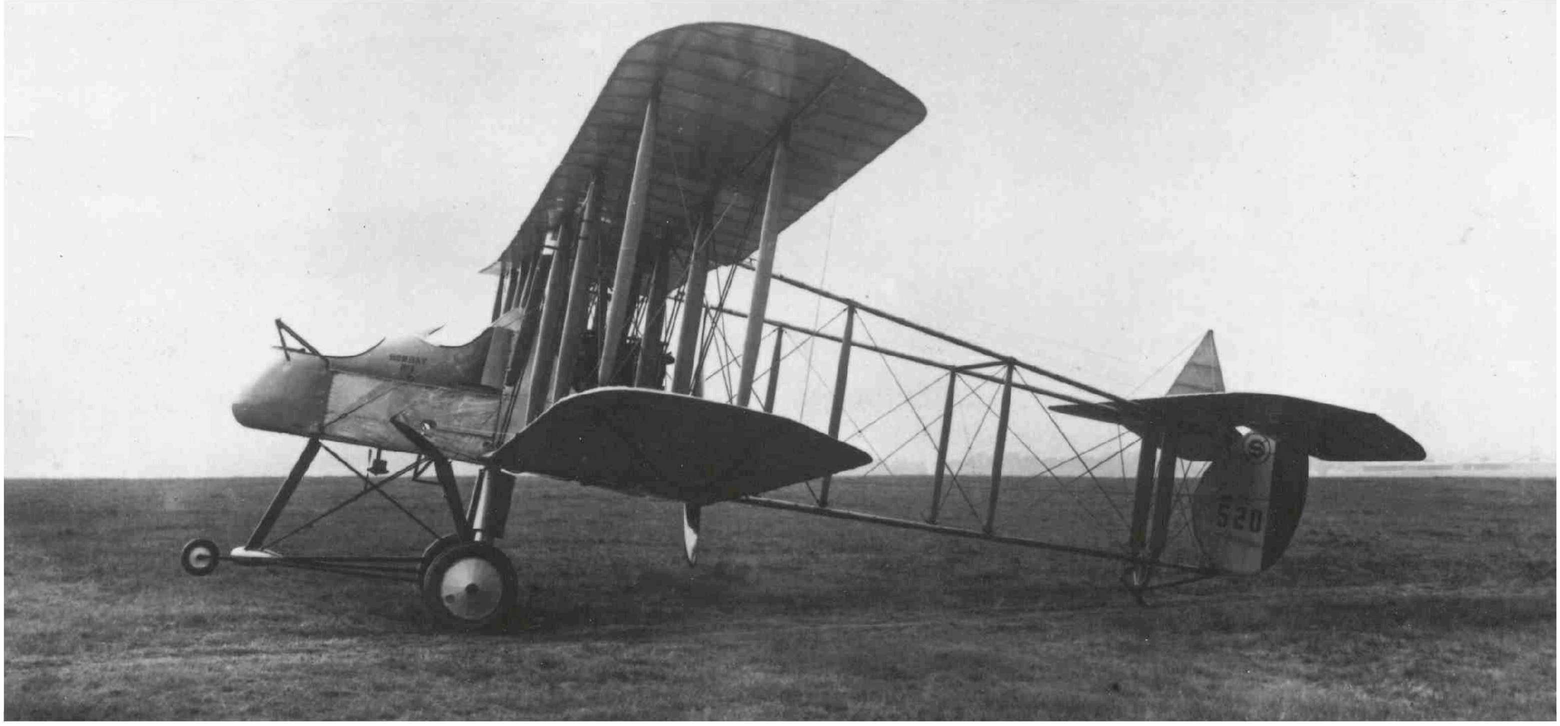



Interplane bracing wires
l/horizontal
ants
Starboard aileron
Strengthening tape
Starboard lower mainplane
All-moving tail
Elevator operating crank
N
354
ry step
Rudder &
elevator cables
ween
Fabric-covered
elevator
Steel spring leaf
tail skid

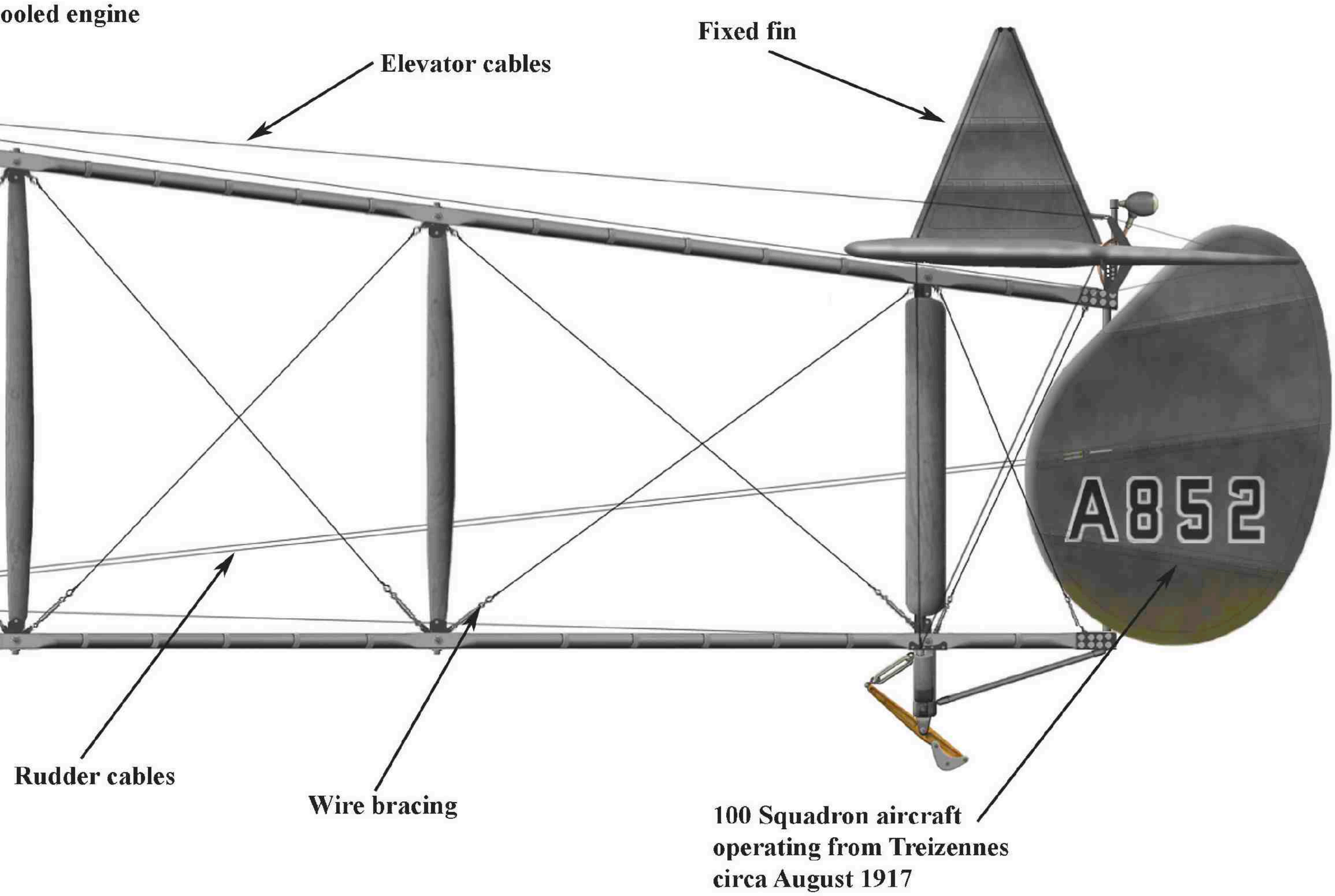


One of many sub-contractor-built F.E.s was this aircraft, F.E.2b, A5478 'Gold Coast No.10' which was built by Boulton & Paul Ltd of Norwich. The aircraft is pictured in service with 23 Squadron, a unit that operated the type from January 1916 to April 1917.



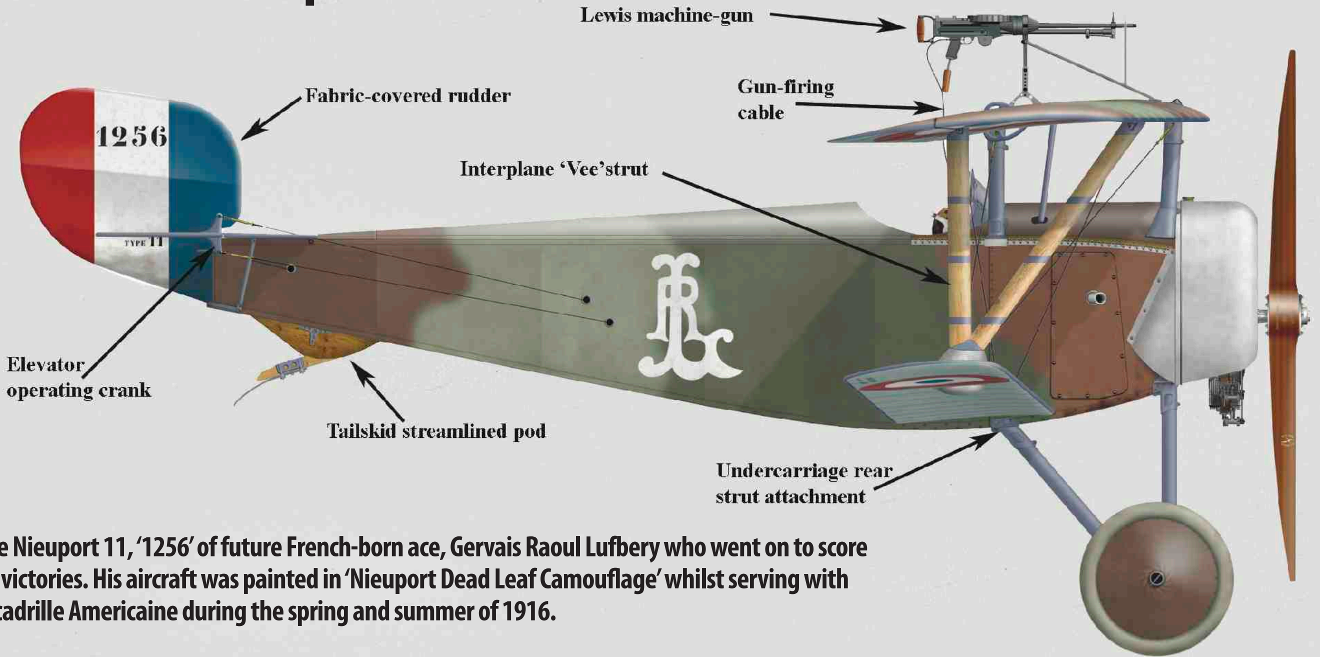


The very first RAF F.E.2b to be delivered to the RFC pictured on October 2, 1915 was actually built by G & J Weir, Ltd of Cathcart. The Royal Aircraft Factory only built a handful of F.E.2b's, the vast majority being constructed by sub-contractors.



A detailed profile of F.E.2b, A852 of 100 Squadron which operated the type from February 1917 to August 1918. The standard maximum bomb load was 350lbs which appears to have been made up here of a single 250lb bomb slung below the fuselage plus four 25lb bombs on the lower wing racks.

Turning the tide of the 'Fokker Scourge'; the Nieuport 11 Bébé or Scout

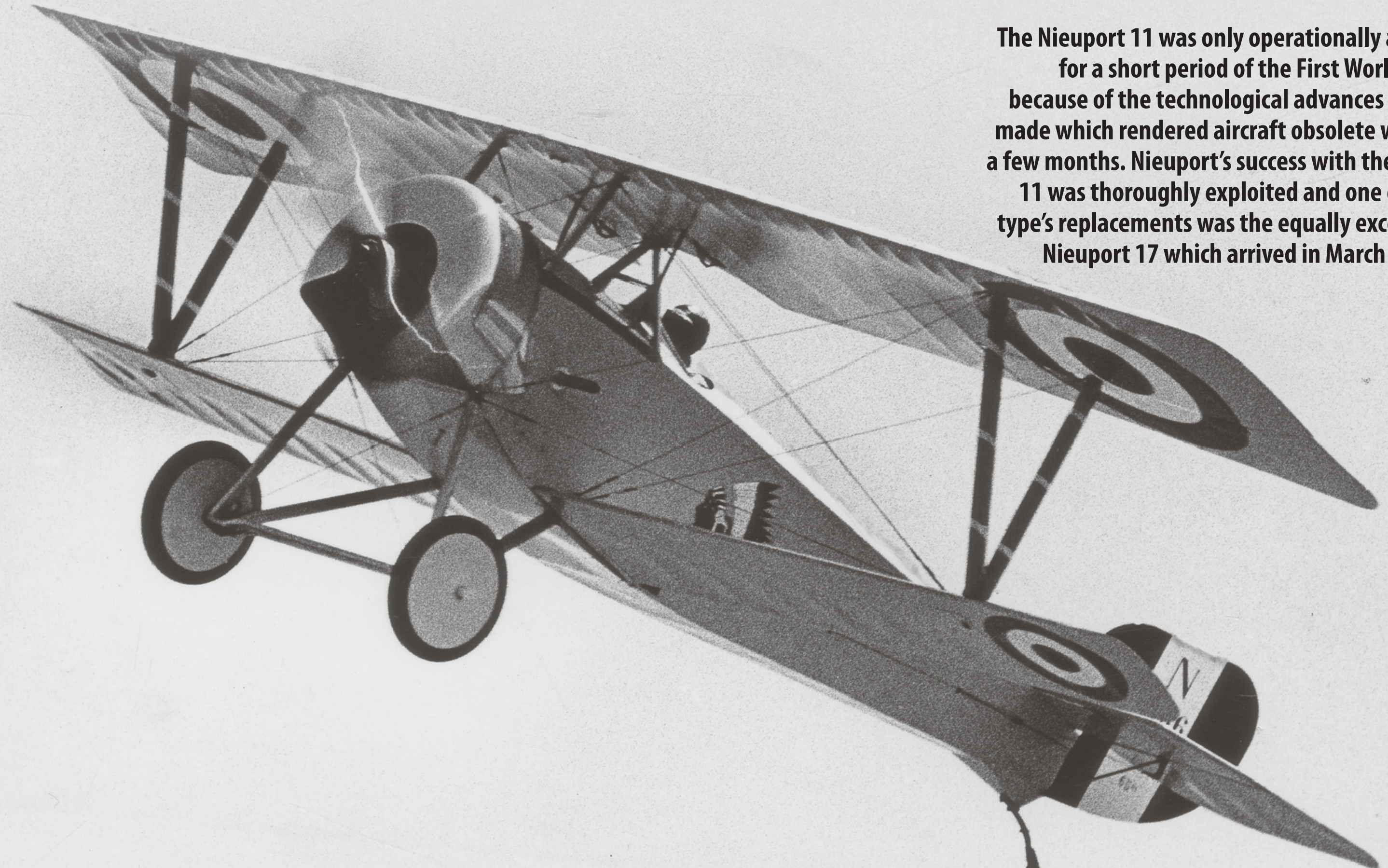


The Nieuport 11, '1256' of future French-born ace, Gervais Raoul Lufbery who went on to score 17 victories. His aircraft was painted in 'Nieuport Dead Leaf Camouflage' whilst serving with Escadrille Americaine during the spring and summer of 1916.

EDOUARD DE NIÉPORT, subsequently changed his surname and established the Societe Anonyme des Etablissements Nieuport in 1910, basing his headquarters at Issy-les-Moulineaux in the suburbs of Paris and forming a flying school at Villacoublay.

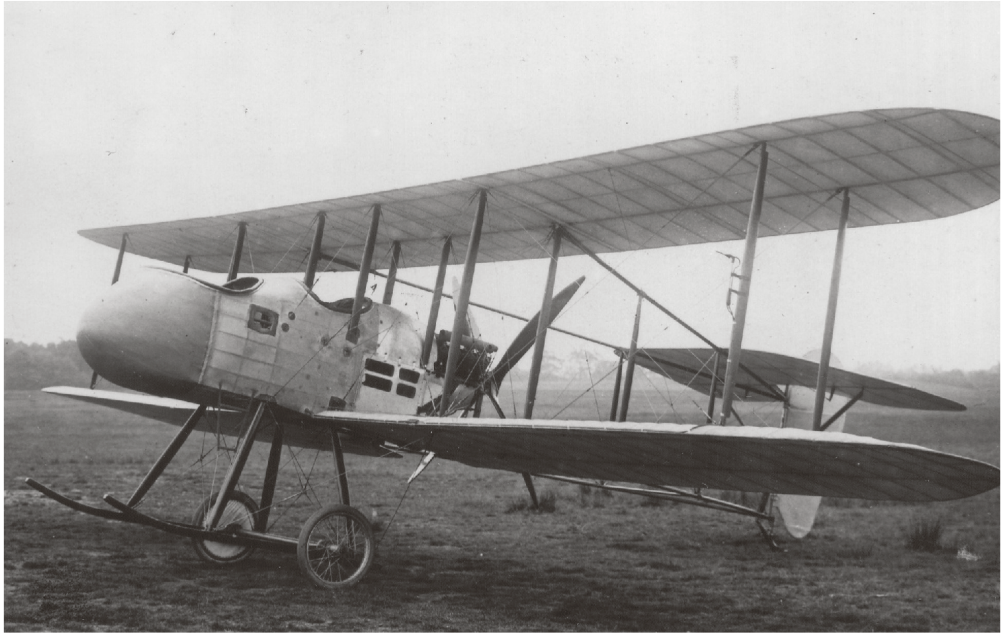
The company went on to design and successfully fly several aircraft, all of which featured good clean lines. By 1914, Nieuport made the fortuitous decision to design and build a new aircraft for that year's Gordon Bennett Trophy which was ultimately cancelled because of the beginning of the First World War. However the pretty little aircraft, created by Gustave Delage, designated the Type 11, had been completed in just four months and it was not long before it attracted the attentions of the military on both sides of the Channel. As a single seat fighter the Type 11 had great potential and large numbers were ordered for the French Aviation Militaire and the RFC.

The Nieuport Type 11, which was known as Bébé (baby) or the Scout, the latter because of its primary tasking, was highly manoeuvrable and had an excellent rate of climb (10,000ft in just over 15 minutes). By January 1916 the Type 11 made a huge instant impression to such a degree that during the Battle of Verdun in February the 'Fokker scourge' was clinically brought to an end and the Allies were back on top.



The Nieuport 11 was only operationally active for a short period of the First World War because of the technological advances being made which rendered aircraft obsolete within a few months. Nieuport's success with the Type 11 was thoroughly exploited and one of the type's replacements was the equally excellent Nieuport 17 which arrived in March 1917.

Farnborough's 'Farman Experimentals'; the RAF F.E.2



RAF F.E.2B TECHNICAL INFORMATION

FIRST FLIGHT: 1915

ENGINE: One 120hp Beardmore

SPAN: 47ft 9in

LENGTH: 32ft 3in

MAX SPEED: 80mph at sea level

CREW: Two, pilot and gunner

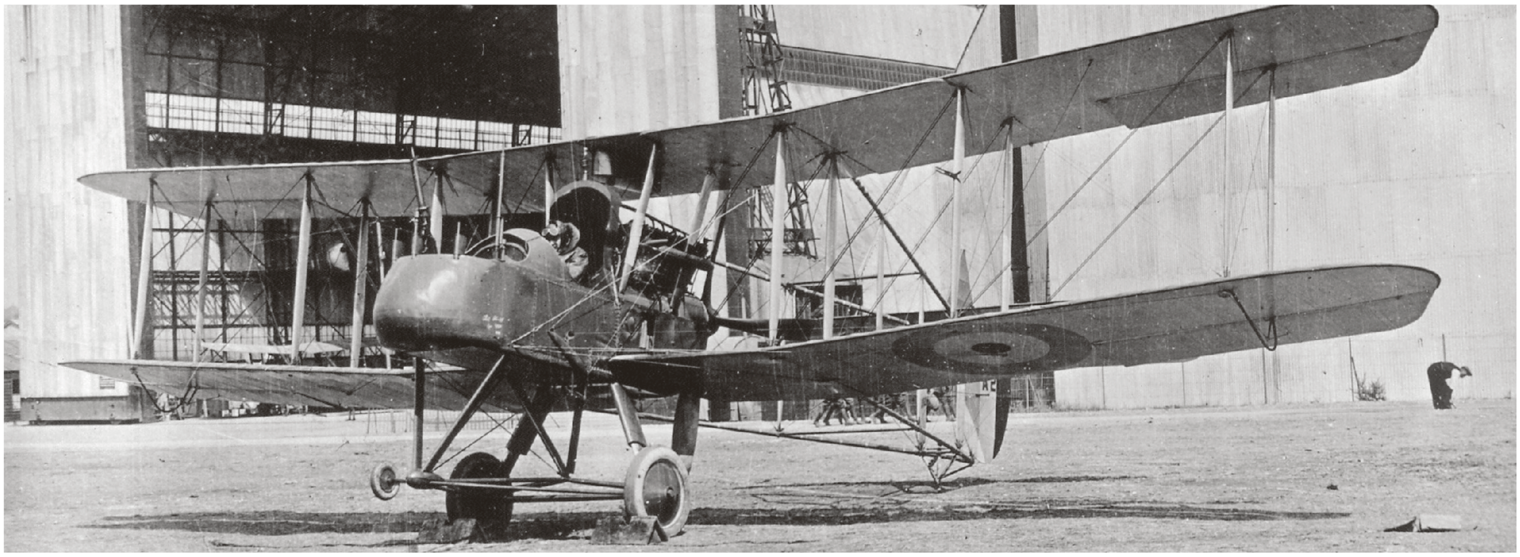
ARMAMENT: (Fighter) Up to two .303in (7.7mm) Lewis machine-guns; (Bomber) 350lb of bombs

◀ **The F.E.2c was designed as a night fighter version of the F.E.2b, the main difference being that the pilot and observer switched positions. Only two were built, the example depicted was powered by a 70hp Renault V-8 water-cooled engine.**

THE DESIGN OF THE Royal Aircraft Factory's F.E.2 series of fighters represents one of the most common approaches of how to resolve the problem of providing effective forward-fire. The problem was cured by mounting the powerplant at the rear of a short fuselage or crew nacelle which could enable the gunner and pilot to focus all their fire through an arc of 180°. The downside to this configuration was that the rear of the aircraft was initially unprotected but this was temporarily resolved by mounting a machine-gun on top of the upper mainplane which was operated by the front gunner by standing on the inner rims of his cockpit; not ideal, but by the time this problem was being looked at all new Allied aircraft had been fitted with synchronised machine-guns.

The original F.E.2a was a disappointing underpowered machine while the F.E.2b introduced the 120hp Beardmore. The F.E.2b entered service in limited numbers with the RFC from 1915 followed by the F.E.2c night fighter. The latter was flown from the front cockpit while an observer took the pilot's original rear position. The F.E.2d had a similar airframe to its predecessors but was powered by a 250hp Rolls-Royce Eagle which markedly improved the type's rate of climb and performance at altitude.

The F.E.2b played its part in reducing the effectiveness of the Eindecker but its nemesis came in the shape of the Albatros and Halberstadt, which were introduced from late 1916. Not withdrawn from operational service until mid-1918, the F.E.2d also gave further service with Home Defence units, to deter Zeppelin and Gotha attacks on Britain. 1,939 F.E.s were built, at least 250 of these are known to have been F.E.2ds. The F.E. series served predominantly with the RFC squadrons.

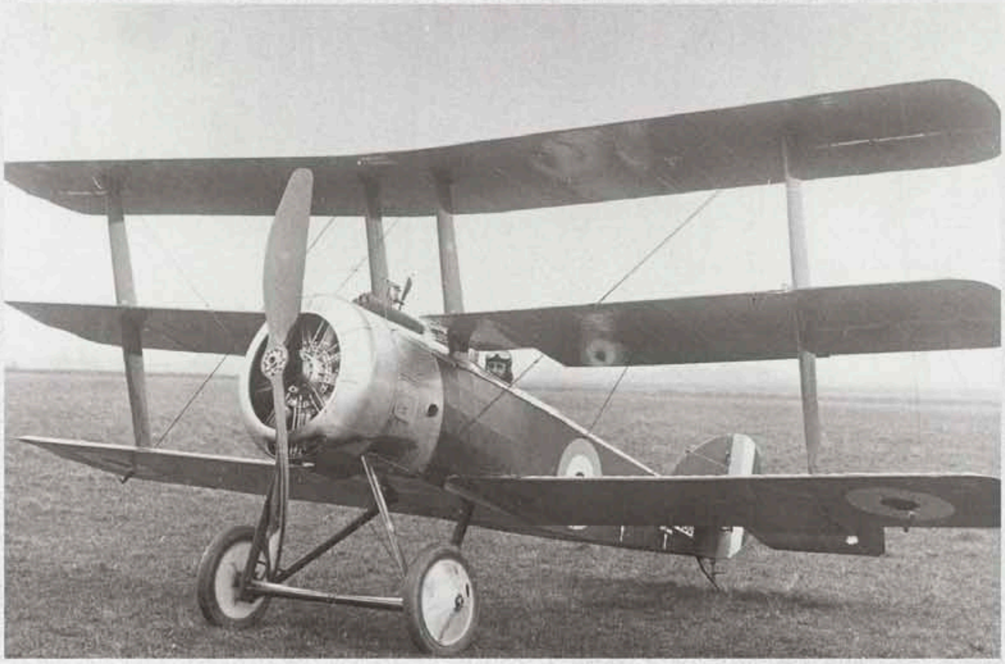


The 250hp Rolls-Royce Eagle-powered F.E.2d was the most purposeful of the 'FE' series with armament on some examples reaching four .303in machine-guns. Approximately 250 were built serving with 20, 25, 33, 36, 38, 57 and 77 Squadrons between June 1916 and August 1918.

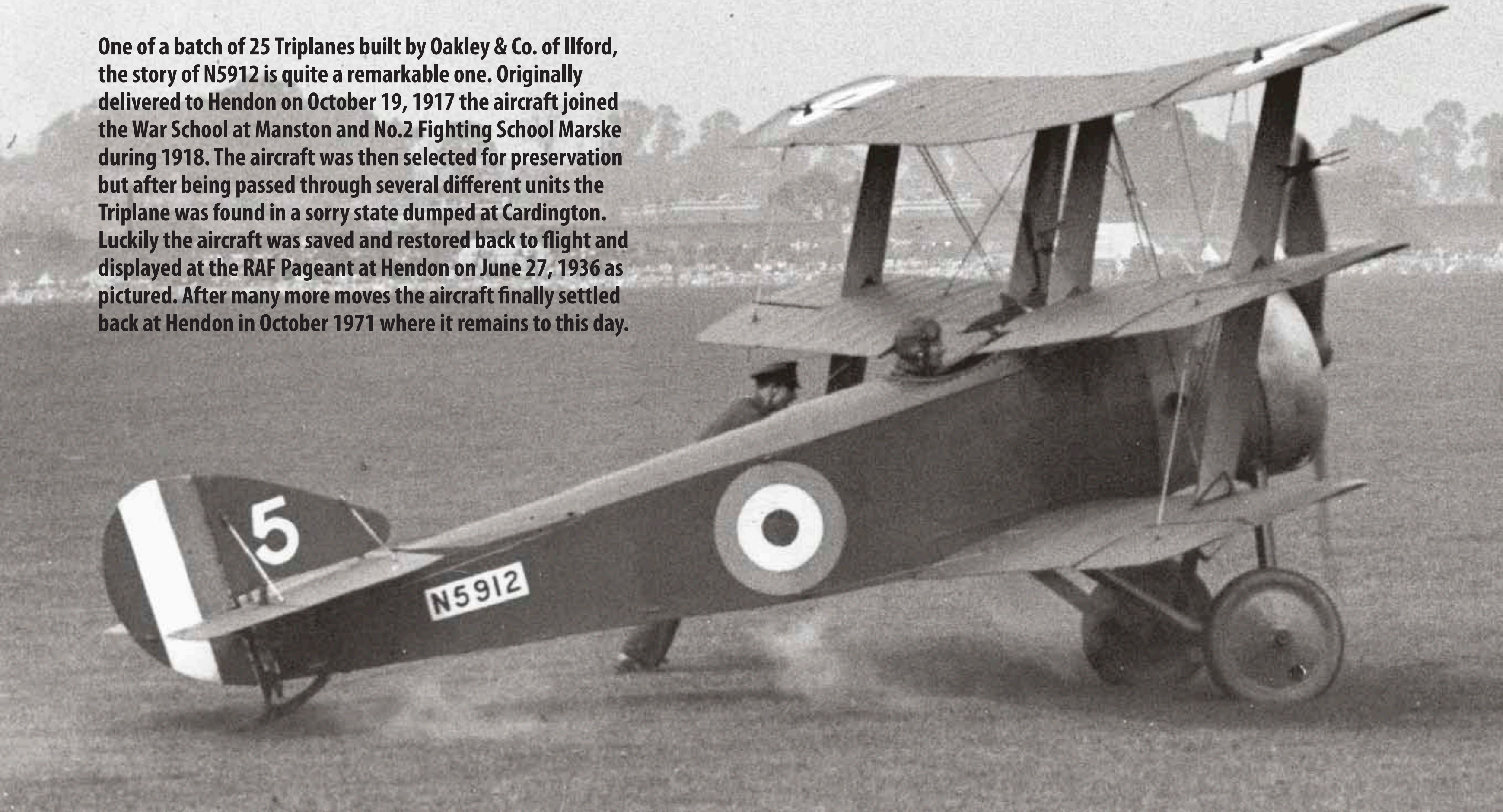
Complete ascendency with so few; the Sopwith Triplane

THE DESIGN OF THE Sopwith Triplane was an inspirational achievement which simply came about by utilising a fuselage and tail unit similar to a Sopwith Pup, marrying it to a more powerful engine and adding an extra mainplane. The result was a classic little fighter which retained the excellent manoeuvrability of the Pup, but was much faster and had a greater rate of climb.

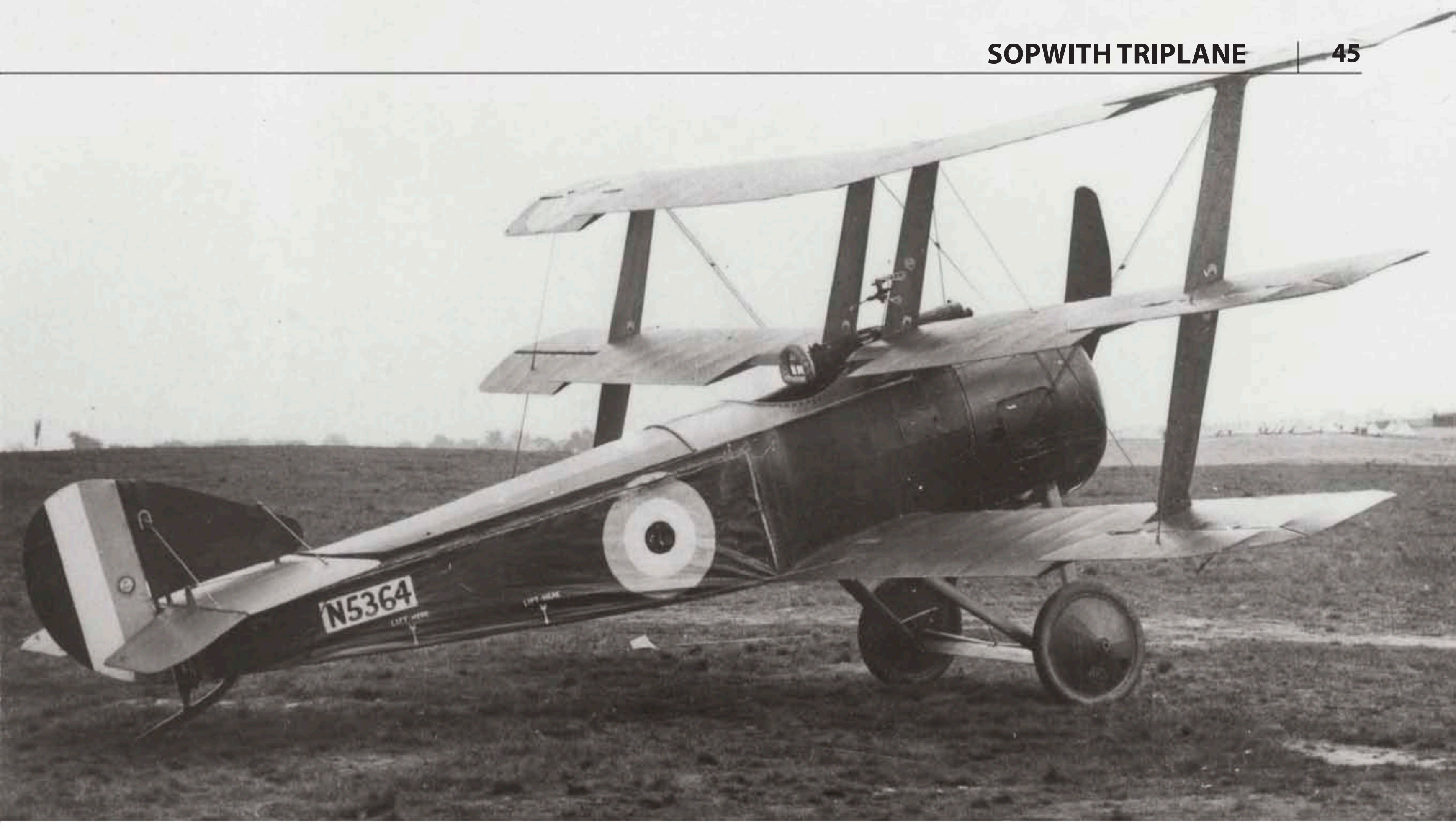
The Triplane first entered service with 1 Naval Squadron in December 1916, followed by 8 Naval Squadron in February 1917 and 9 and 10 Naval Squadrons in April and May respectively. On entering service the Triplane was the first aircraft to operate over the Western Front with a triple wing configuration and it immediately caused a stir with the Germans, who set about designing their own version. Flown exclusively by the RNAS, only 147 Triplanes were built, but during a seven month period the little fighter gained virtually complete ascendency over all of its opponents until it was superseded by the equally excellent Sopwith Camel. Once the Triplane had stamped its authority over the trenches, they were actively avoided by many German pilots who knew they stood no chance against the Allied machine.



N5350 was the first machine of a batch of 40 aircraft ordered on July 23, 1916 under Contract CP.120945/16 and 87/A/1086, built by Clayton & Shuttleworth Ltd. After a brief period of service with the Design Flight at Eastchurch the Triplane joined 10 Naval Squadron, only to be lost off Boulogne after the engine failed on April 23, 1917.

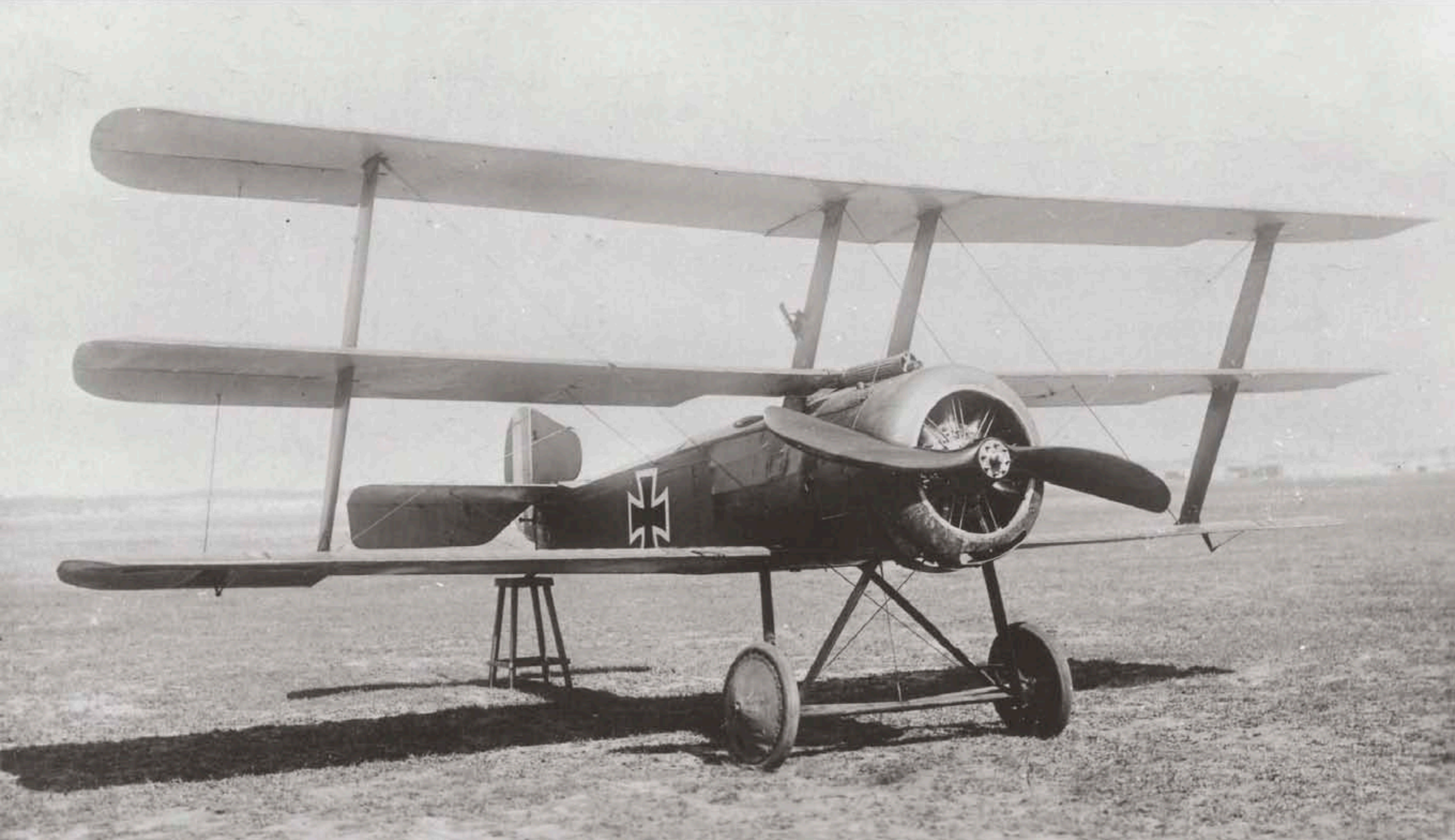


One of a batch of 25 Triplanes built by Oakley & Co. of Ilford, the story of N5912 is quite a remarkable one. Originally delivered to Hendon on October 19, 1917 the aircraft joined the War School at Manston and No.2 Fighting School Marske during 1918. The aircraft was then selected for preservation but after being passed through several different units the Triplane was found in a sorry state dumped at Cardington. Luckily the aircraft was saved and restored back to flight and displayed at the RAF Pageant at Hendon on June 27, 1936 as pictured. After many more moves the aircraft finally settled back at Hendon in October 1971 where it remains to this day.



▲ N5364 was another Clayton & Shuttleworth-built machine which was delivered to 10 Naval Squadron on June 16, 1917. The Triplane was shot down by Ltn H Dilthey of Jasta 27 (then under command of Lt Hermann Göring) on July 24, 1917. The pilot, Flt Sub-Lt T C May was killed when the aircraft's wings folded in a dive and it crashed south of Passchendaele.

▼ The capturing of an intact Sopwith Triplane would have been quite a prize for the Germans who immediately set about designing a triplane of their own. Every German aircraft manufacturer attempted to come up with an equivalent design and as a result at least 34 triplane prototypes were built including the Fokker V.4 which would lead to the Fokker Dr.I.



SOPWITH TRIPLANE TECHNICAL INFORMATION

FIRST FLIGHT: May 28, 1916

ENGINE: One 110hp or 130hp Clerget

SPAN: 26ft 6in

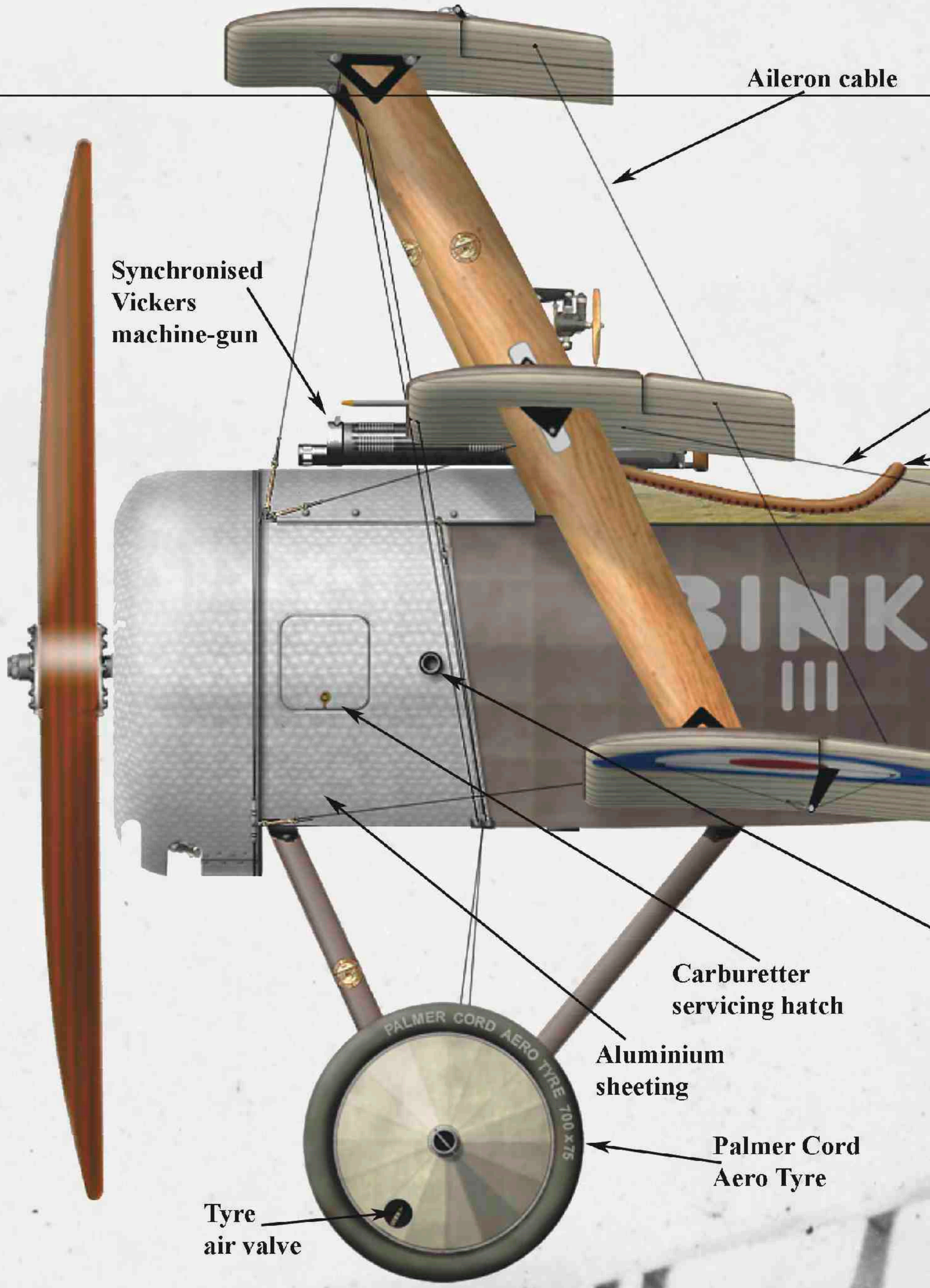
LENGTH: 18ft 10in

MAX SPEED: 117mph at 5,000ft

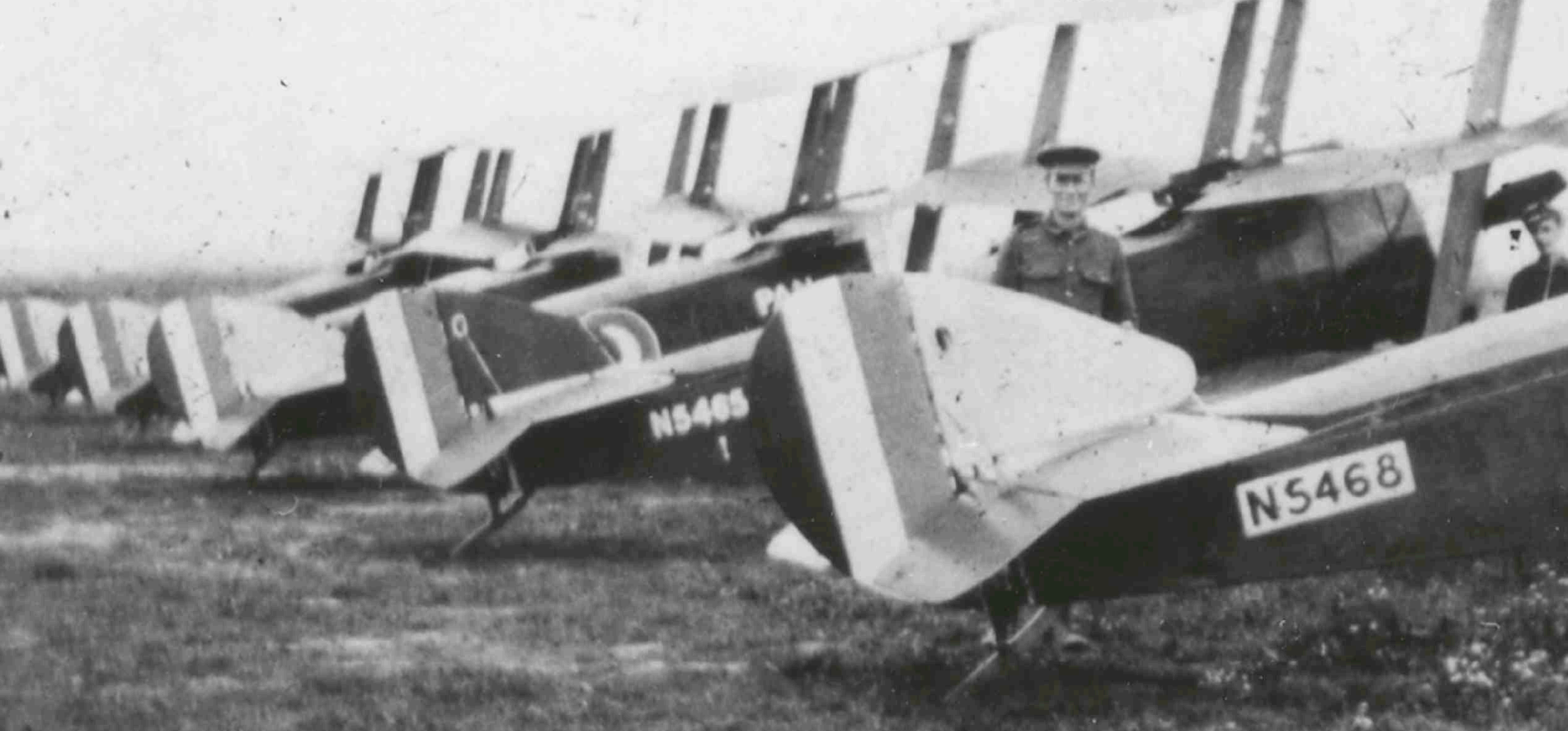
CREW: One

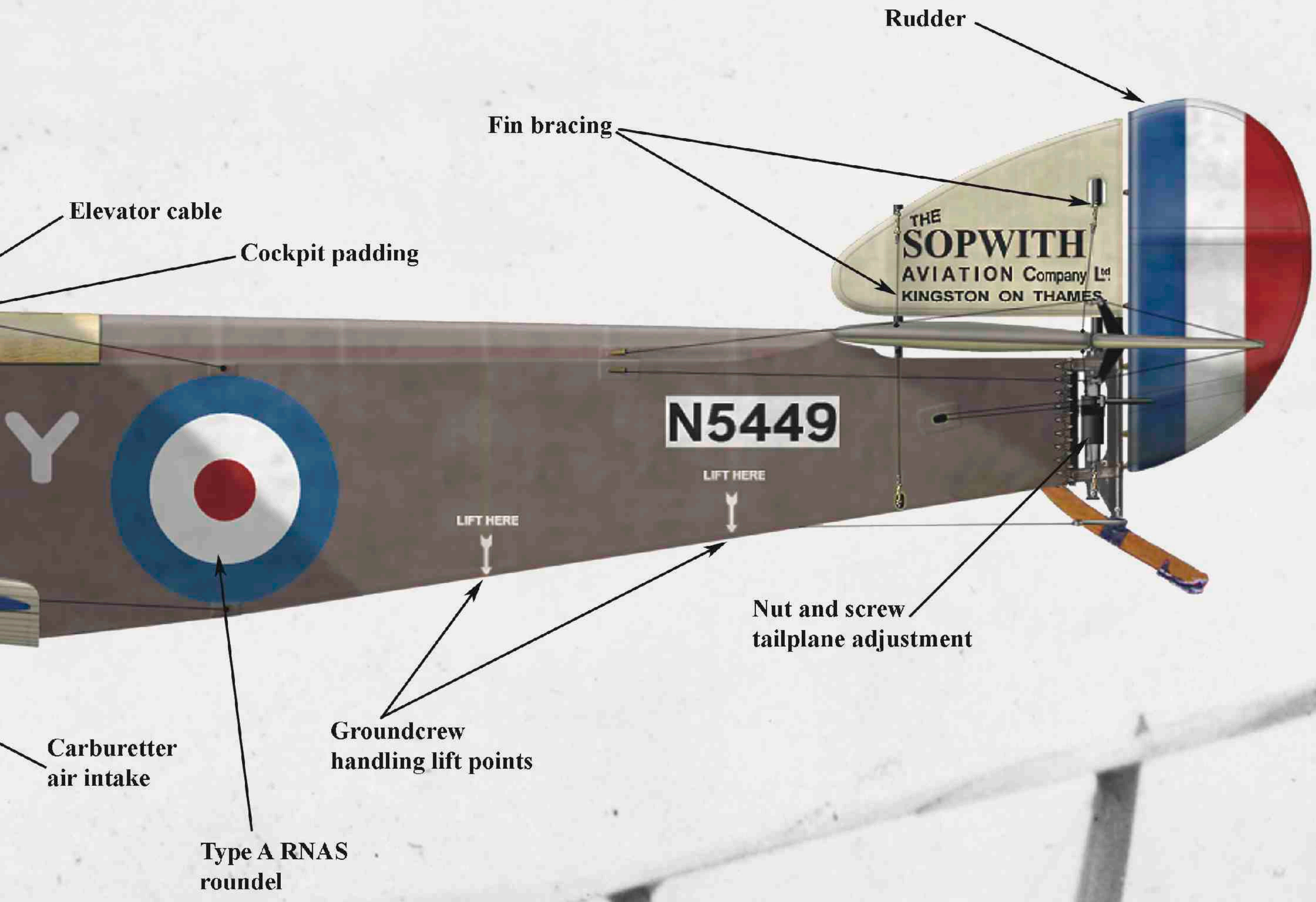
ARMAMENT: One or two forward-firing synchronised .303in (7.7mm) Vickers machine-guns

▶ First delivered to Dover in February 1917, N5449 was issued to 8 Naval Squadron on February 28 and was christened 'Joan'. However by April 1917 the aircraft was renamed 'Binky' and in the hands of Flt Cdr P A Johnston, the Triplane brought down an Albatros on May 3, 1917. Later 'Binky' was downed by machine-gun fire near Bailleul but, incredibly managed to survive eight hours of enemy shelling and was returned to service.


Aileron cable
Synchronised Vickers machine-gun
BINK
III
Carburetter servicing hatch
Aluminium sheeting
PALMER CORD AERO TYRE 700 x 75
Palmer Cord Aero Tyre
Tyre air valve

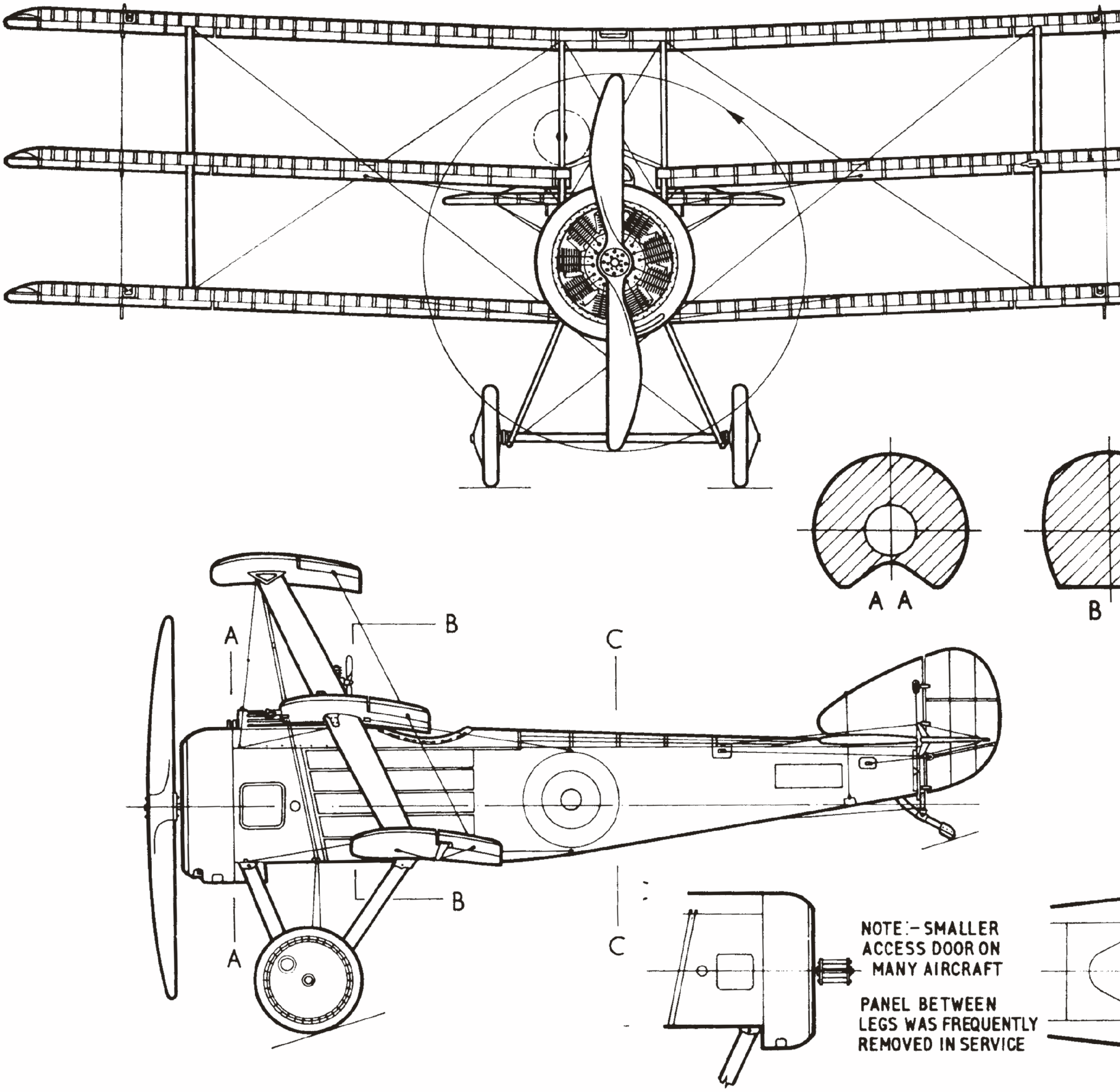
▼ The Sopwith Triplanes of 8 Naval Squadron pictured at Dunkirk sometime in 1917. Flt Cdr C H B Jenner-Parson's aircraft, N5468 'Angel' is pictured in the foreground. During its service with 8 Naval Squadron, the Triplane was credited with a single Albatros Scout and Aviatik; the latter was shared with two others.




Rudder
Fin bracing
Elevator cable
Cockpit padding
THE SOPWITH AVIATION Company Ltd KINGSTON ON THAMES
N5449
LIFT HERE
LIFT HERE
Nut and screw tailplane adjustment
Groundcrew handling lift points
Carburetter air intake
Type A RNAS roundel

ANCEL

Sopwith Triplane


A A
B
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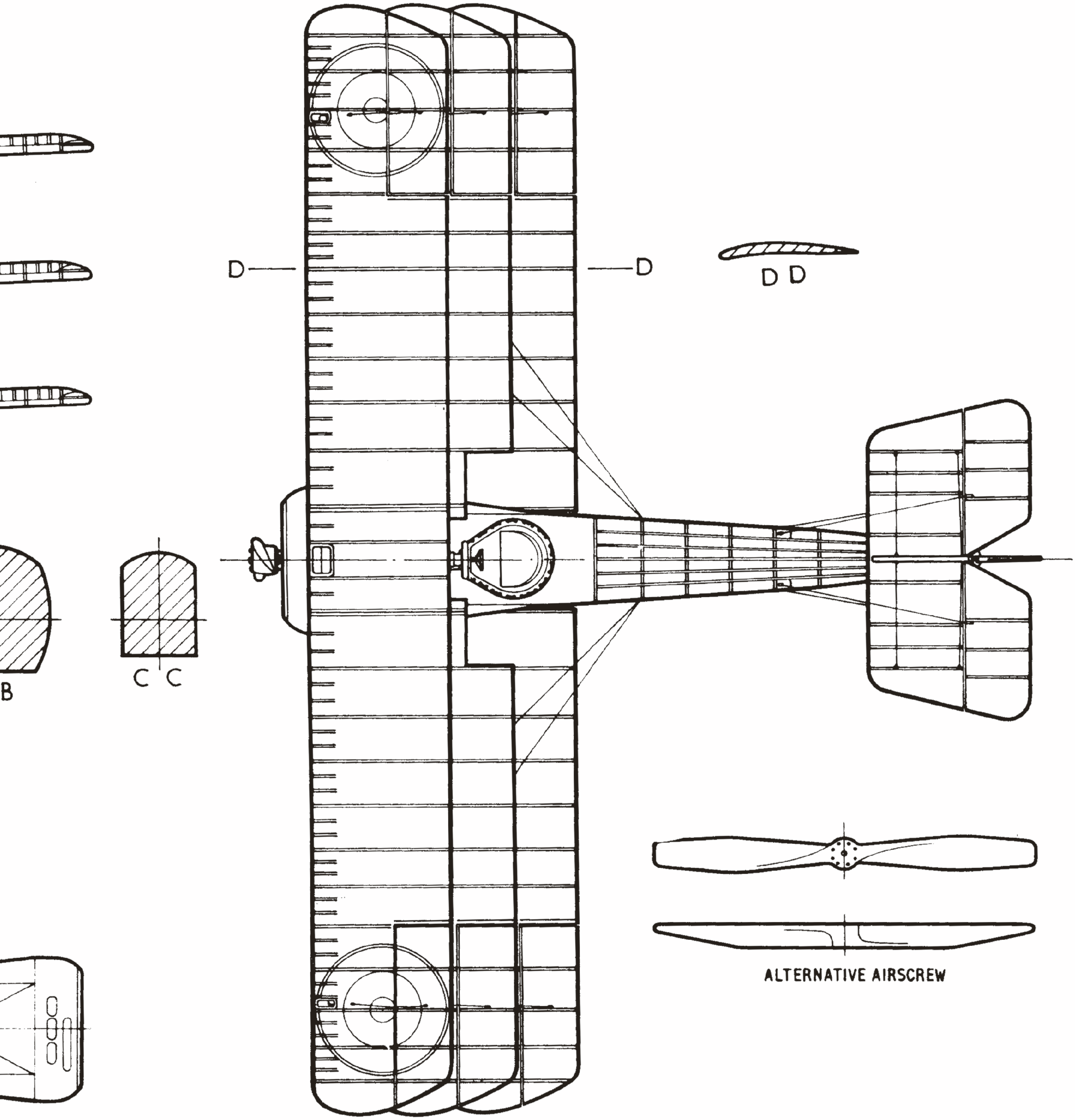
NOTE:- SMALLER ACCESS DOOR ON MANY AIRCRAFT
PANEL BETWEEN LEGS WAS FREQUENTLY REMOVED IN SERVICE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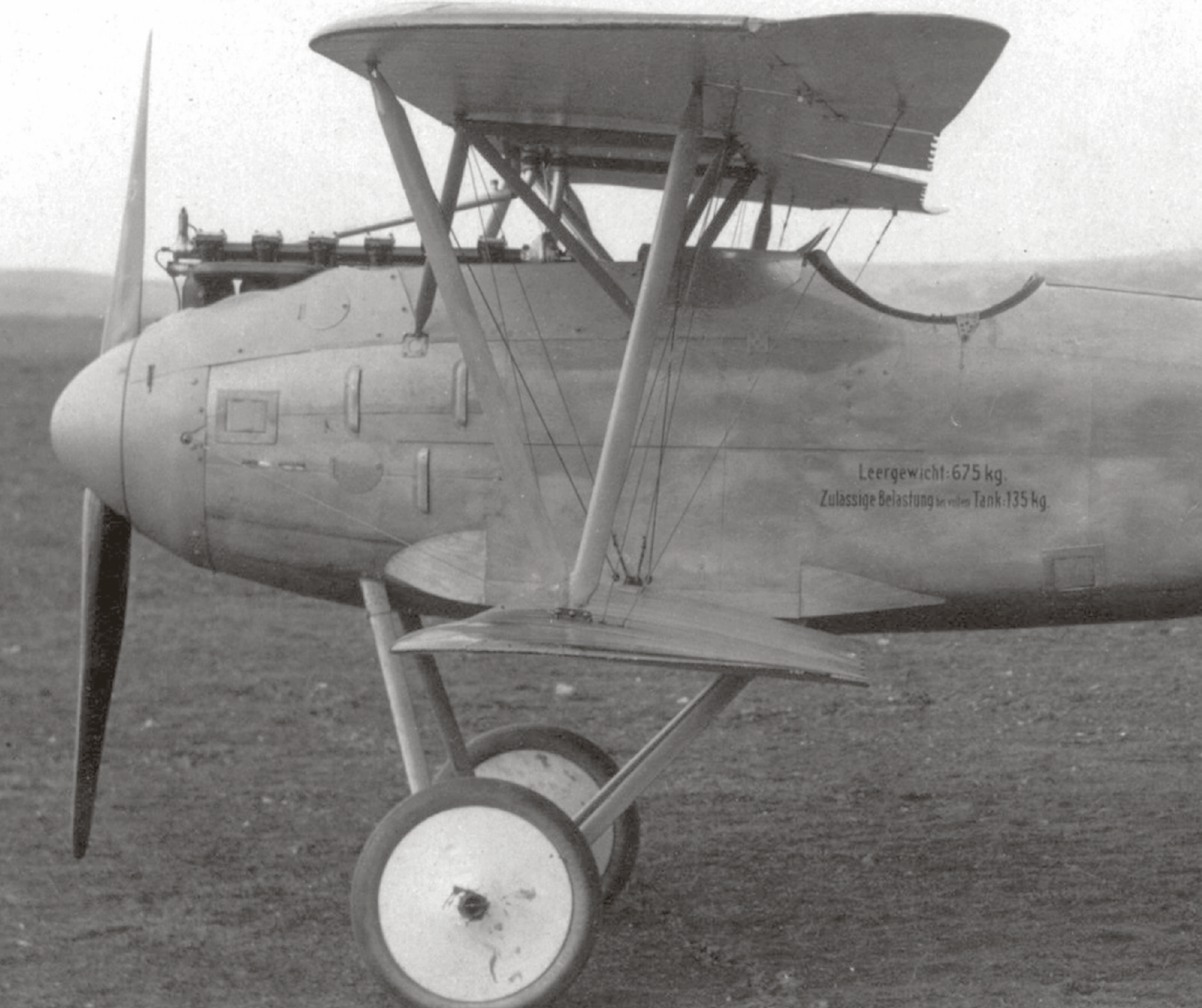
ALTERNATIVE AIRSCREW

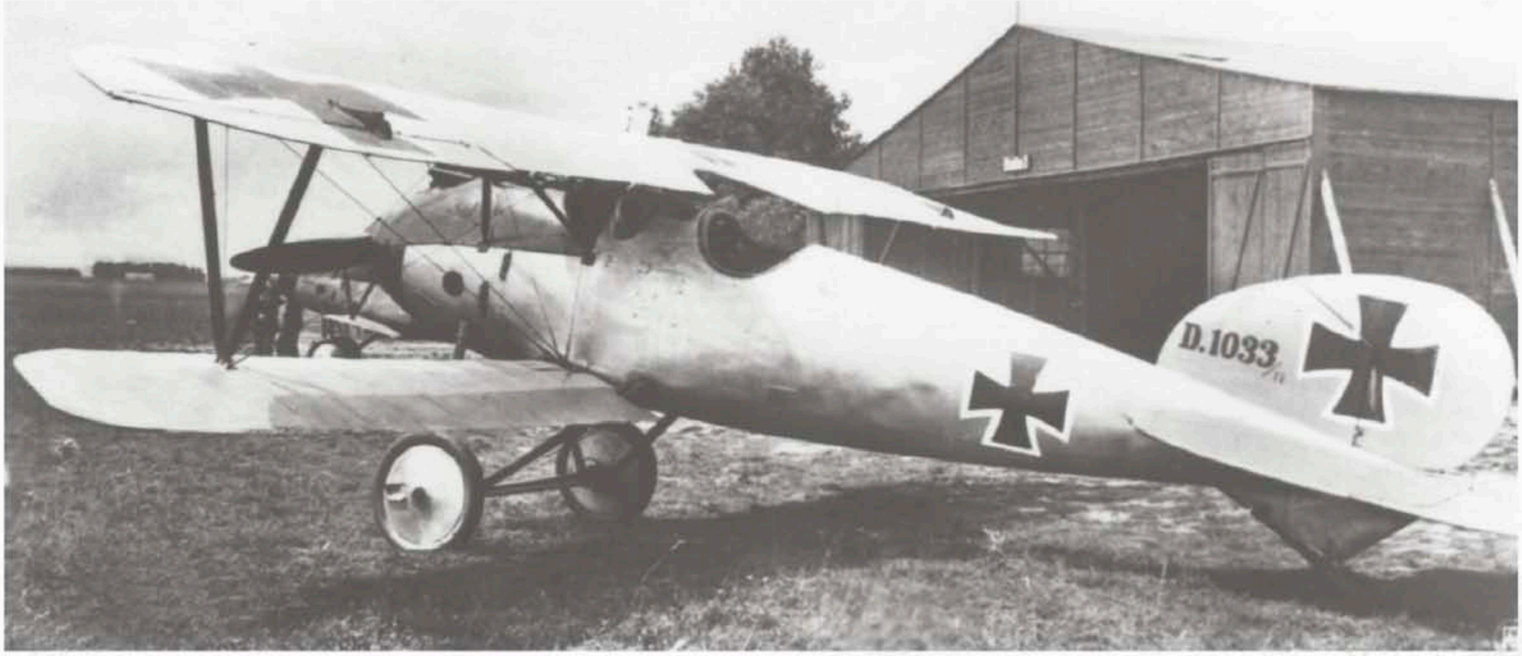
Stemming the Allied tide; the Albatros D.V

ALBATROS FLUGZEUGWERKE GMBH was established at Johannisthal, Berlin on December 20, 1909 by Walter Huth and Otto Wiener. In a very short period of time the German designers had progressed from their first machine, which was little more than a version of a Farman biplane to some of the most capable fighter aircraft of the First World War.

Albatros could not rest on their previous design successes as the Allies continued to produce superior aircraft. It was now time for an improved version of the D.III. The new D.V was similar in general layout to the D.III but the fuselage had an elliptical cross-section which was strengthened by additional longerons on each side of it. The fuselage, because of the unique design, was stronger than the D.IIIs and was over 70lbs lighter. The wings were identical to the D.III but the upper was lowered even closer to the fuselage and the aileron controls were redesigned so that the control linkage was only contained in the upper wing. Other changes included a new rudder and a larger faired headrest which was removed from virtually all D.Vs after it was quickly discovered that it restricted any view to the rear. The prototype was in the air by the end of April 1917, and by the following month, an order for 200 aircraft was received.

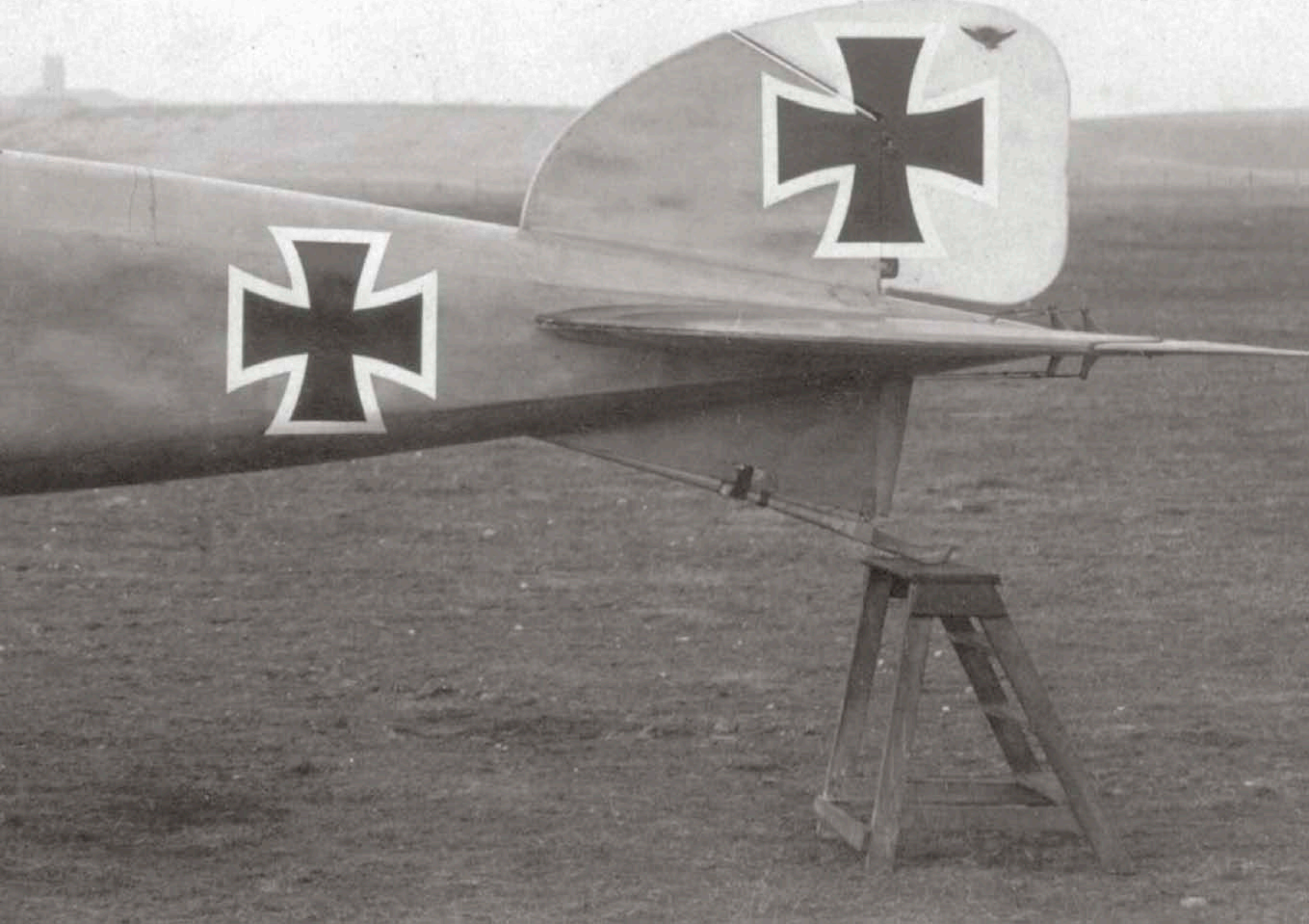
The D.V was not a well-received aircraft and its performance, though marginally improved, was little better than the D.III. The D.III had had its own problems with structural failures of the lower wing but the D.V seemed to suffer even more so and far too many were being lost in accidents. An attempt to cure the problem with additional bracing had little effect and the words of Manfred von Richthofen are worth quoting to show how unhappy frontline pilots were with the D.V. In a letter dated July 1917, Richthofen stated, " ...so obsolete and so ridiculously inferior to the English that one can't do anything with this aircraft." After an example was captured by the RFC, subsequent tests backed up Richthofen and test pilots found that the D.V was not manoeuvrable, was heavy on the controls and very tiring to fly.





▲ Manfred von Richthofen flew four Albatross D.Vs during his career including D1033/17, his second whilst serving with Jasta 1. The aircraft had a red nose, tailplane, fin, rudder, struts, undercarriage, wheel covers and upper wing.

▼ The D.III was the first of a manoeuvrable series of Albatros fighters, but pilot's fears of structural failure were definitely justified because of insufficient rigidity at the lower interplane strut, which would result in flutter, quickly followed by disintegration.



ALBATROS D.V TECHNICAL INFORMATION

FIRST FLIGHT: April 1917

ENGINE: One 180/200hp Mercedes D.IIa

SPAN: 29ft 8.25in

LENGTH: 18ft 0.5in

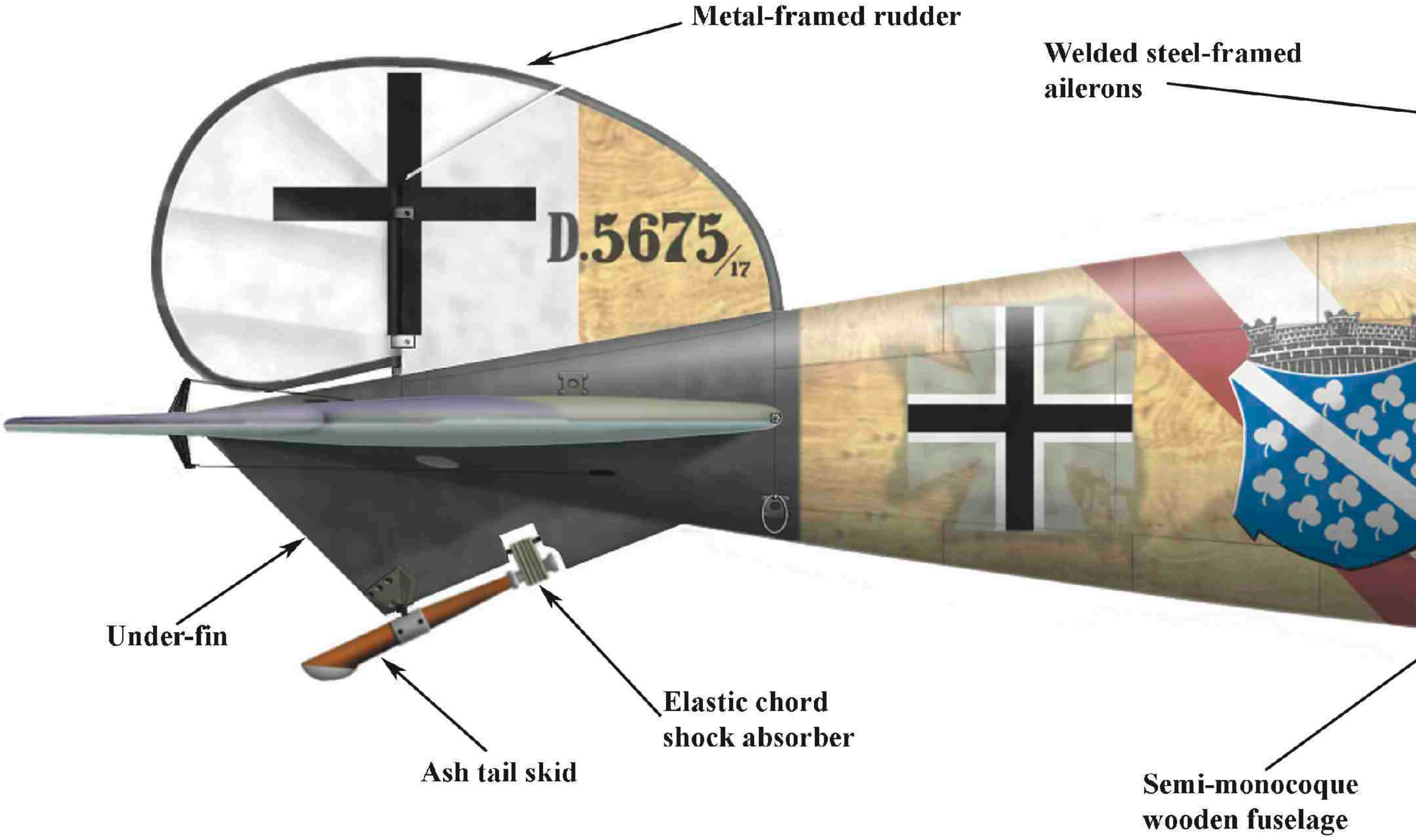
MAX SPEED: 116mph

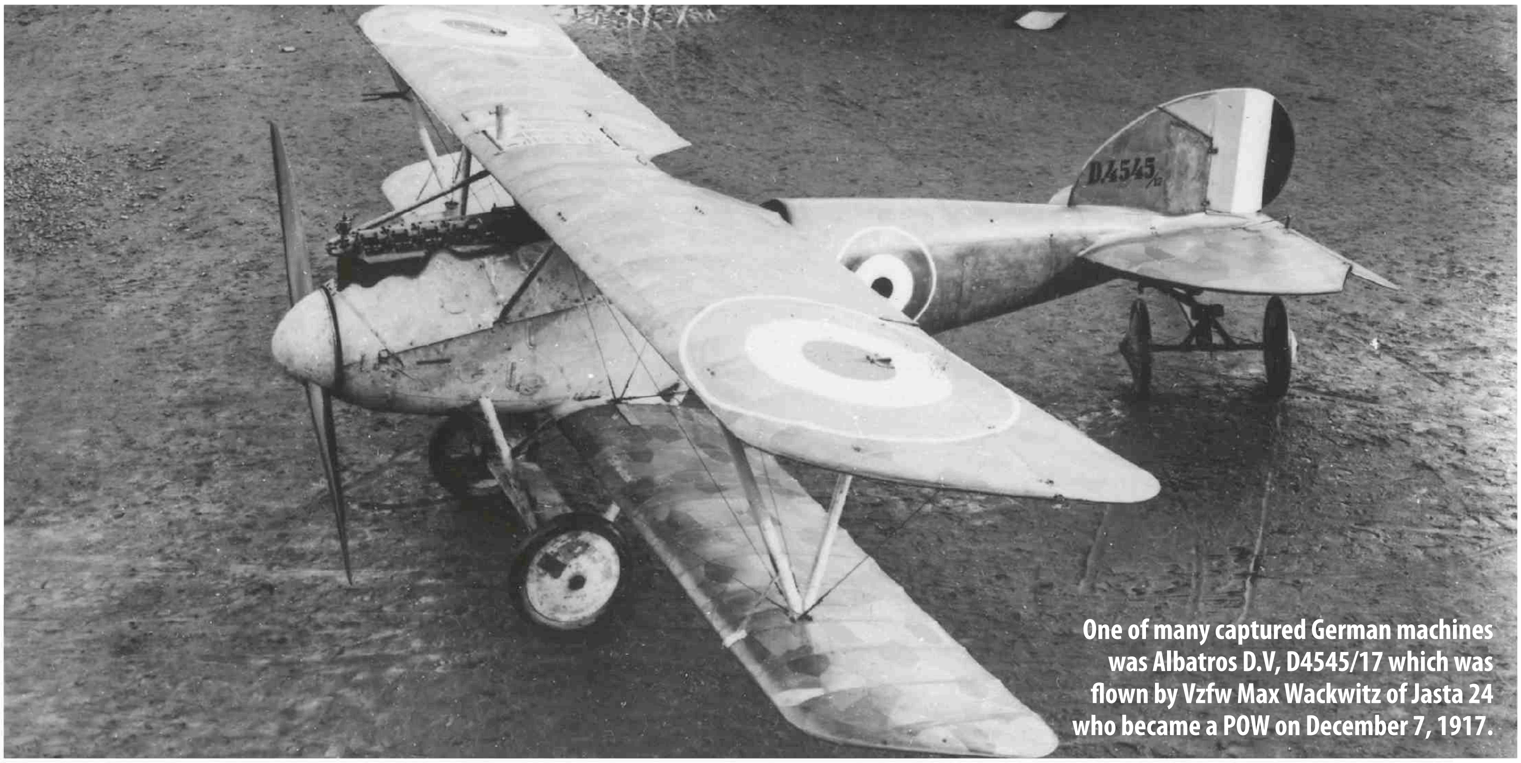
CREW: One

ARMAMENT: Two fixed forward-firing 7.92mm (0.31in) LMG 08/15 machine-guns

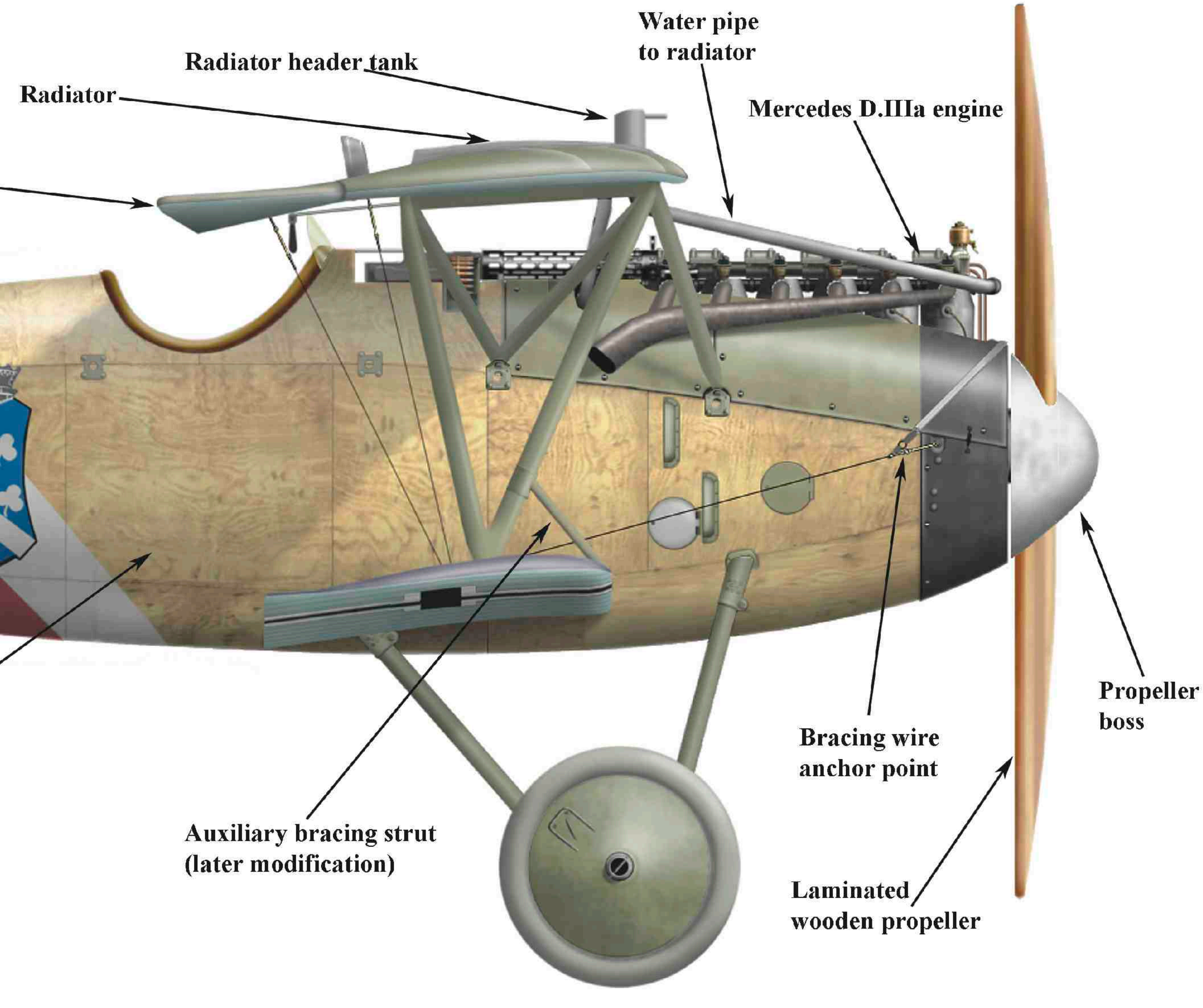
The superb Albatros D.Va replica serialled ZK-TVD built by the New Zealand company Vintage Aviator Ltd in 2011. The Albatros is painted in the colours of D.7343/17 of Jasta 61 flown by Karl Freidrich Kurt Jentsch. First flown on January 1, 1912 the aircraft was shipped to the UK and unveiled at Old Warden in August 2012 and flown there until September 22. The aircraft is now on display at the RAF Museum, Hendon.

▼ Albatros D.Va D5675/17 of Jasta 58 proudly displays the coat of arms of the city of Casell (Spelt Kassel since 1928). The D.Va differed from the original D.V by having a revised upper wing and the aileron control system as the D.III.


Metal-framed rudder
Welded steel-framed ailerons
D.5675/17
Under-fin
Elastic chord shock absorber
Ash tail skid
Semi-monocoque wooden fuselage



One of many captured German machines was Albatros D.V, D4545/17 which was flown by Vzfw Max Wackwitz of Jasta 24 who became a POW on December 7, 1917.

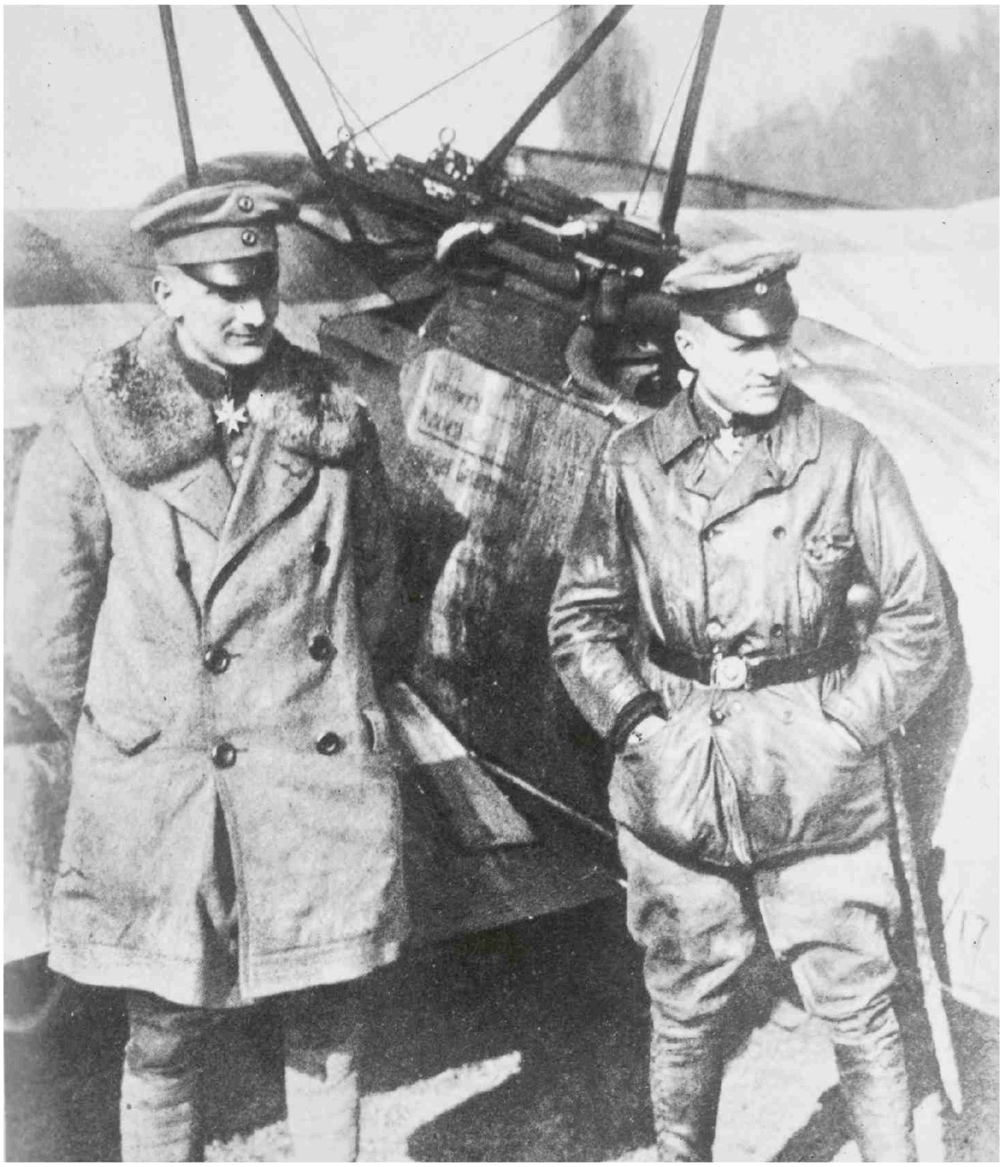

Water pipe to radiator
Radiator header tank
Radiator
Mercedes D.IIIa engine
Propeller boss
Bracing wire anchor point
Auxiliary bracing strut (later modification)
Laminated wooden propeller

In reply to the Sopwith Triplane; the Fokker Dr.I

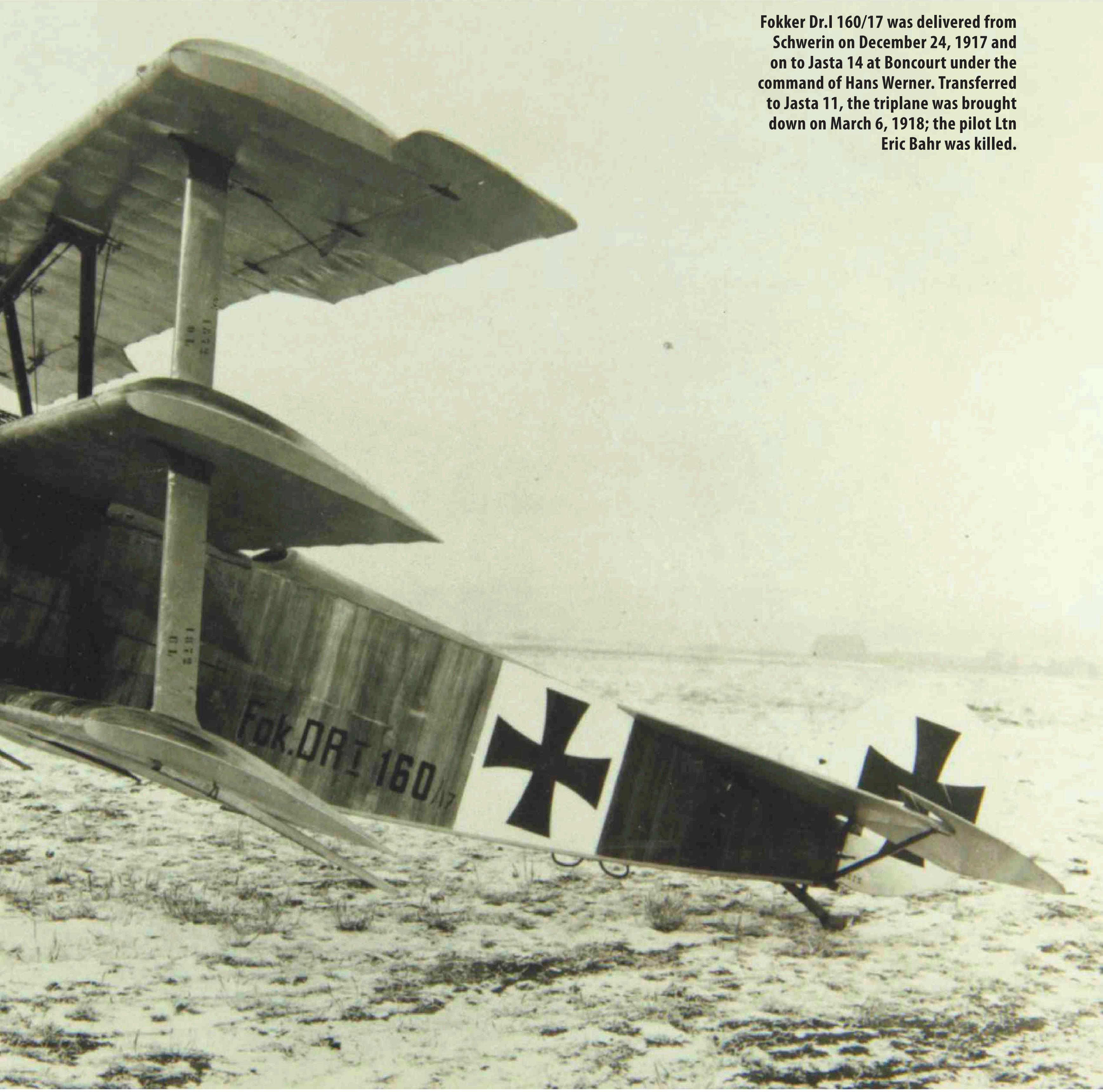
WHEN THE CAPABILITY of the Sopwith Triplane turned from rumour to truth, German manufacturers lost no time in designing their own version of the highly manoeuvrable aircraft. Fokker was one of many manufacturers who responded to the challenge, leading the way with the Fokker V.3 prototype designed by Reinhold Platz. This quickly evolved into the V.4 which became the production F.I which was subsequently renamed by the military as the Fokker Dr.I.

The German triplane rapidly gained a reputation which was exaggerated beyond the aircraft's actual capability, mainly because the type was chosen by the legendary Manfred von Richthofen. The 'Red Baron' liked the Dr.I for its good rate of climb and excellent manoeuvrability but the triplane never fully gained aerial superiority over the Allied machines. The Dr.I's maximum speed was generally inferior to the Allies and many of the 320 built were lost as a result of structural failure rather than enemy action; a similar problem that plagued the Sopwith Triplane. The problem became so bad, all Dr.Is were grounded for a period in 1917 while the wings were strengthened.

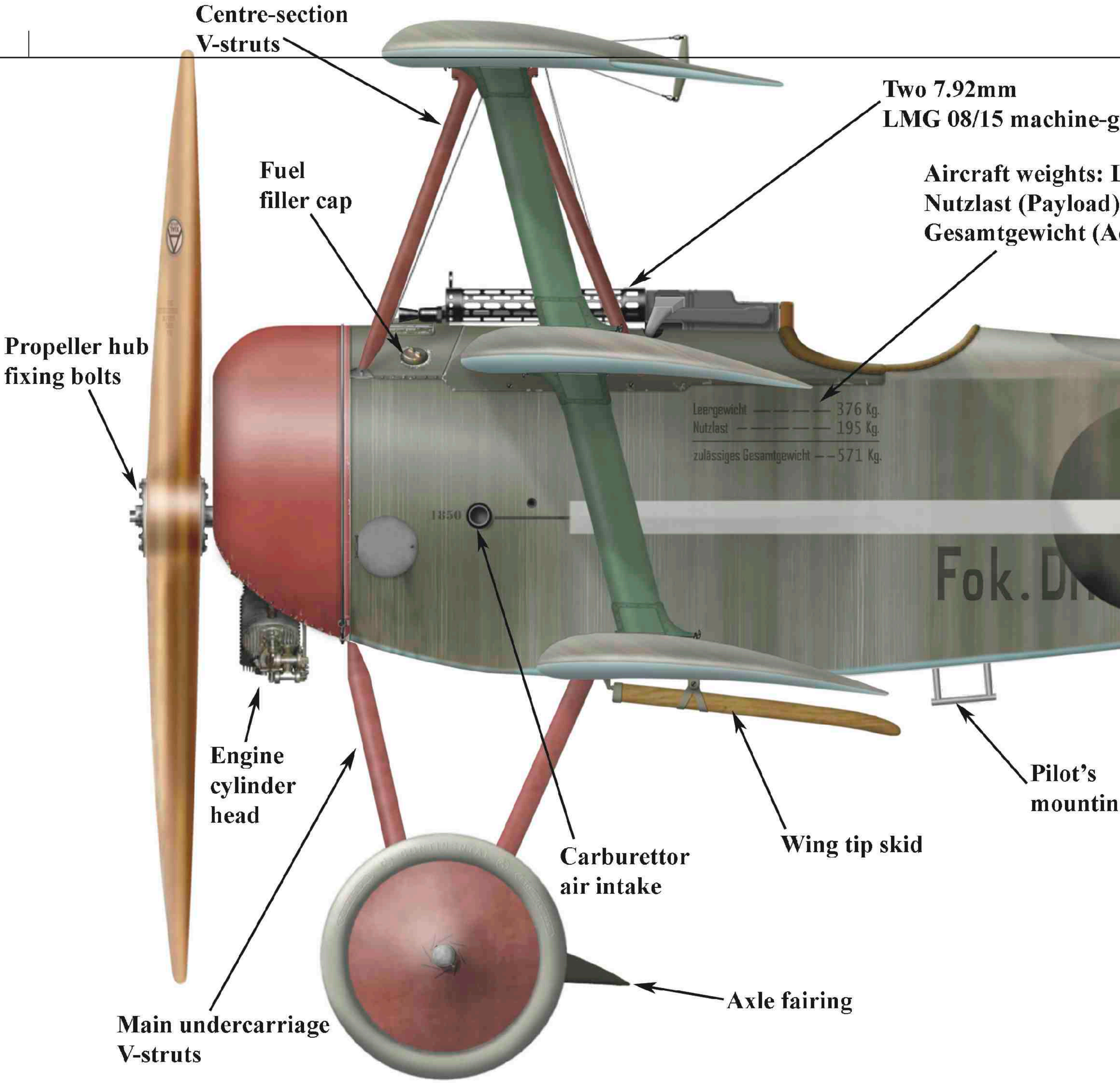
Production came to an end in May 1918 and the Dr.I, despite its foibles remained in service until the summer of 1918.



Manfred von Richthofen with his brother Lothar (left) a proficient and highly experienced pilot in his own right. Lothar von Richthofen was credited with 40 victories by the end of the conflict; 33 of them were scored between April and August 1918.



Fokker Dr.I 160/17 was delivered from Schwerin on December 24, 1917 and on to Jasta 14 at Boncourt under the command of Hans Werner. Transferred to Jasta 11, the triplane was brought down on March 6, 1918; the pilot Ltn Eric Bahr was killed.



FOKKER DR.I TECHNICAL INFORMATION

FIRST FLIGHT: July 5, 1917

ENGINE: One 110hp Thulin-built Le Rhone or Oberursel Ur.II

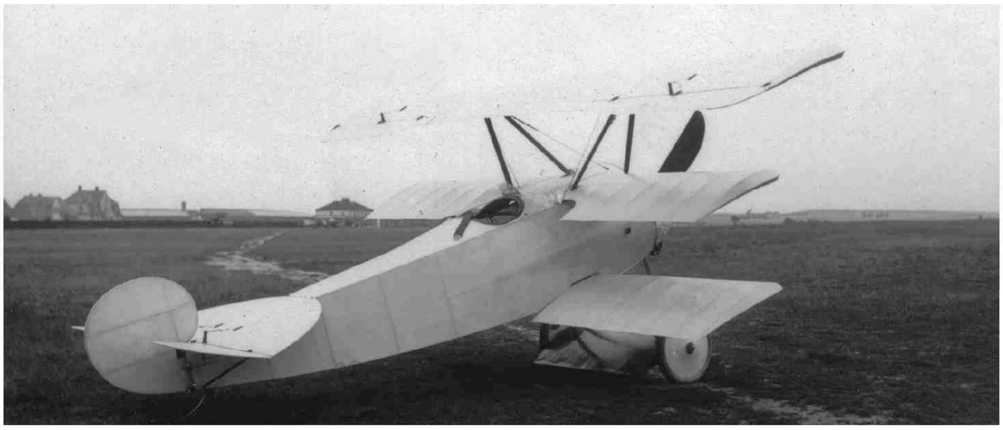
SPAN: 23ft 7.5in

LENGTH: 18ft 11.25in

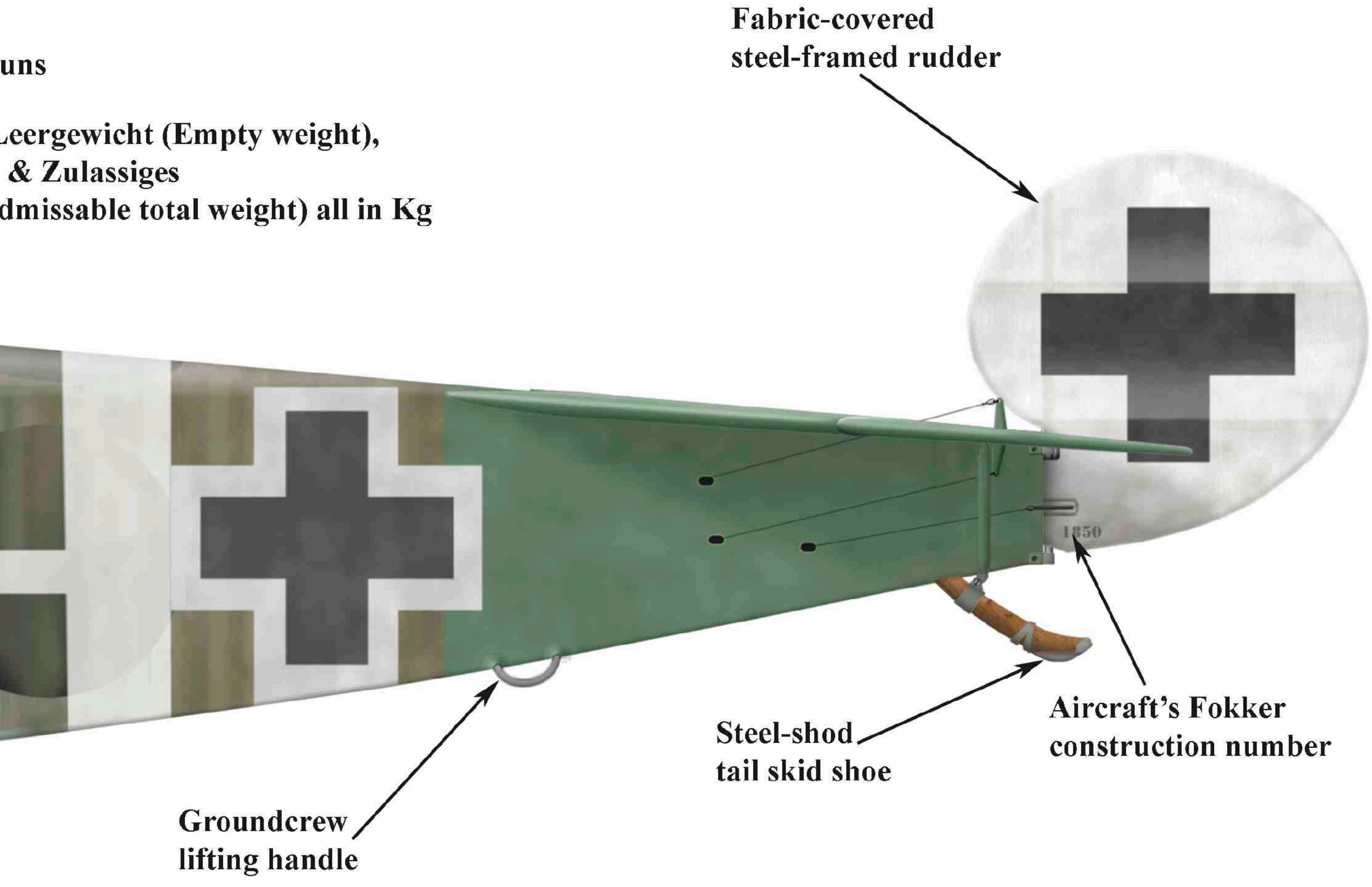
MAX SPEED: 103mph at 13,125ft

CREW: One

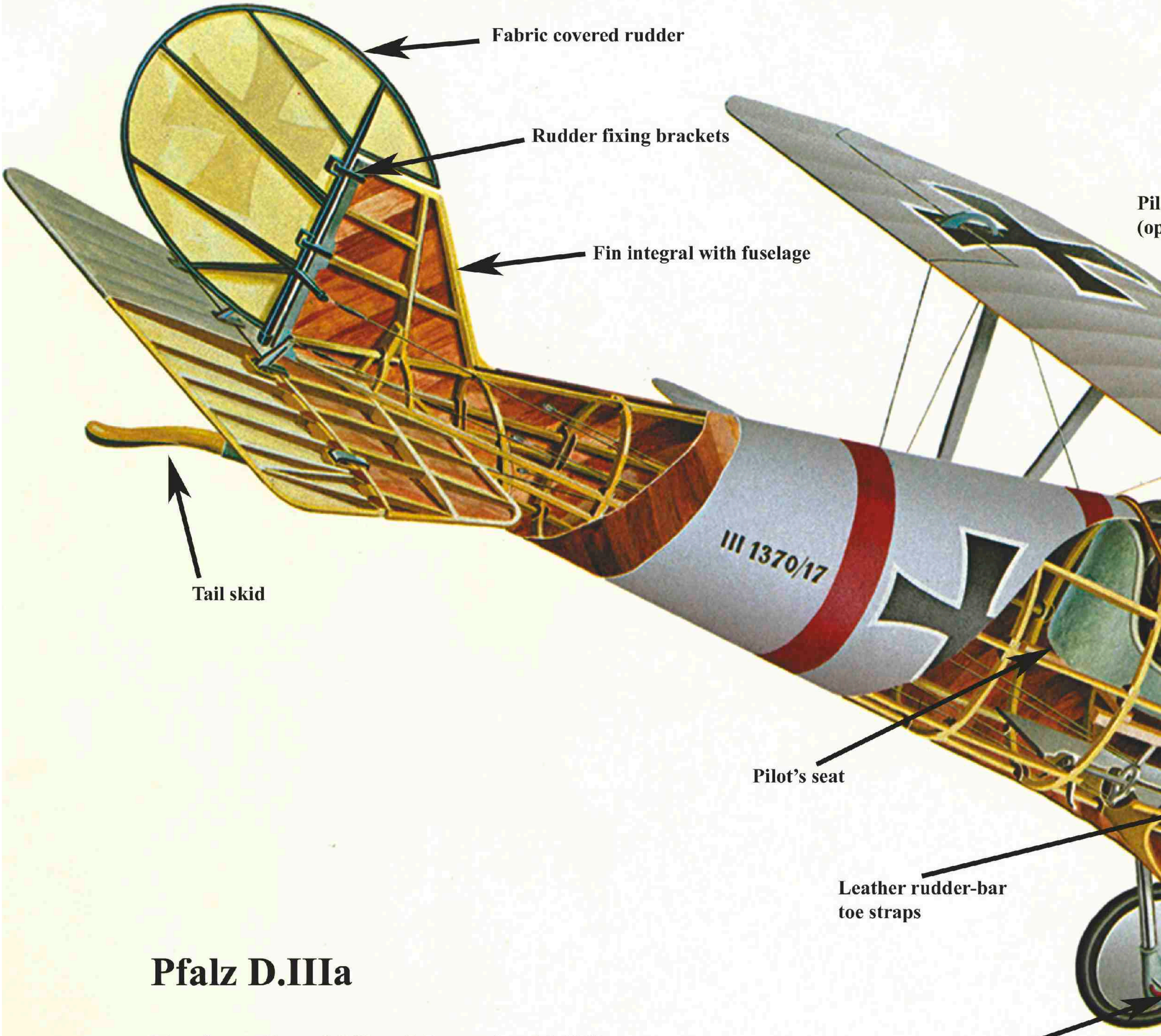
ARMAMENT: Two fixed forward-firing 7.92mm (0.31in) LMG 08/15 machine-guns



The first triplane designed by Fokker's Reinhold Platz was the V.3 prototype which represented the general configuration of what was to become the famous Dr.I. The V.3 suffered badly from wing vibration which was subsequently cured in the next prototype, the V.4.

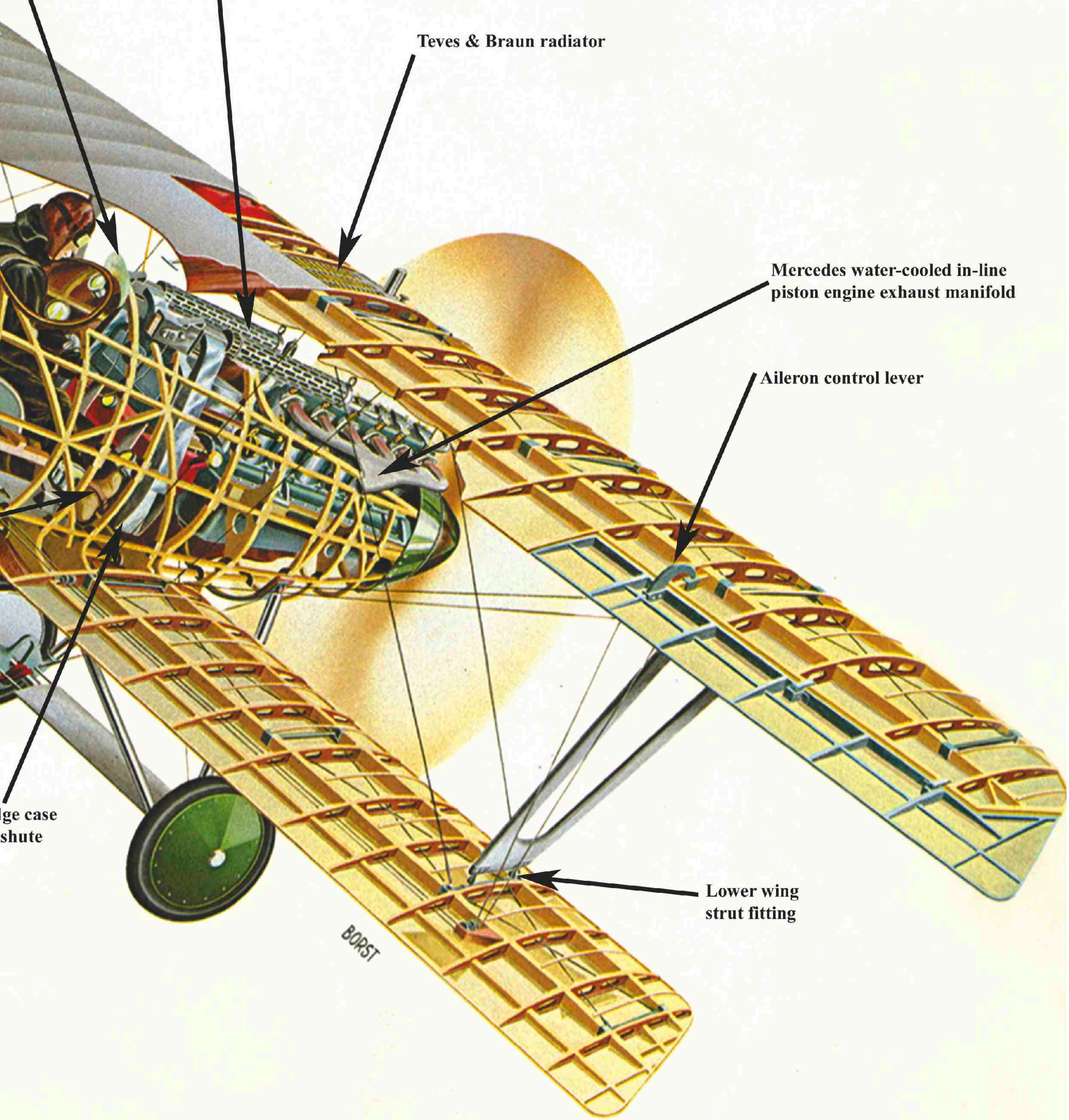


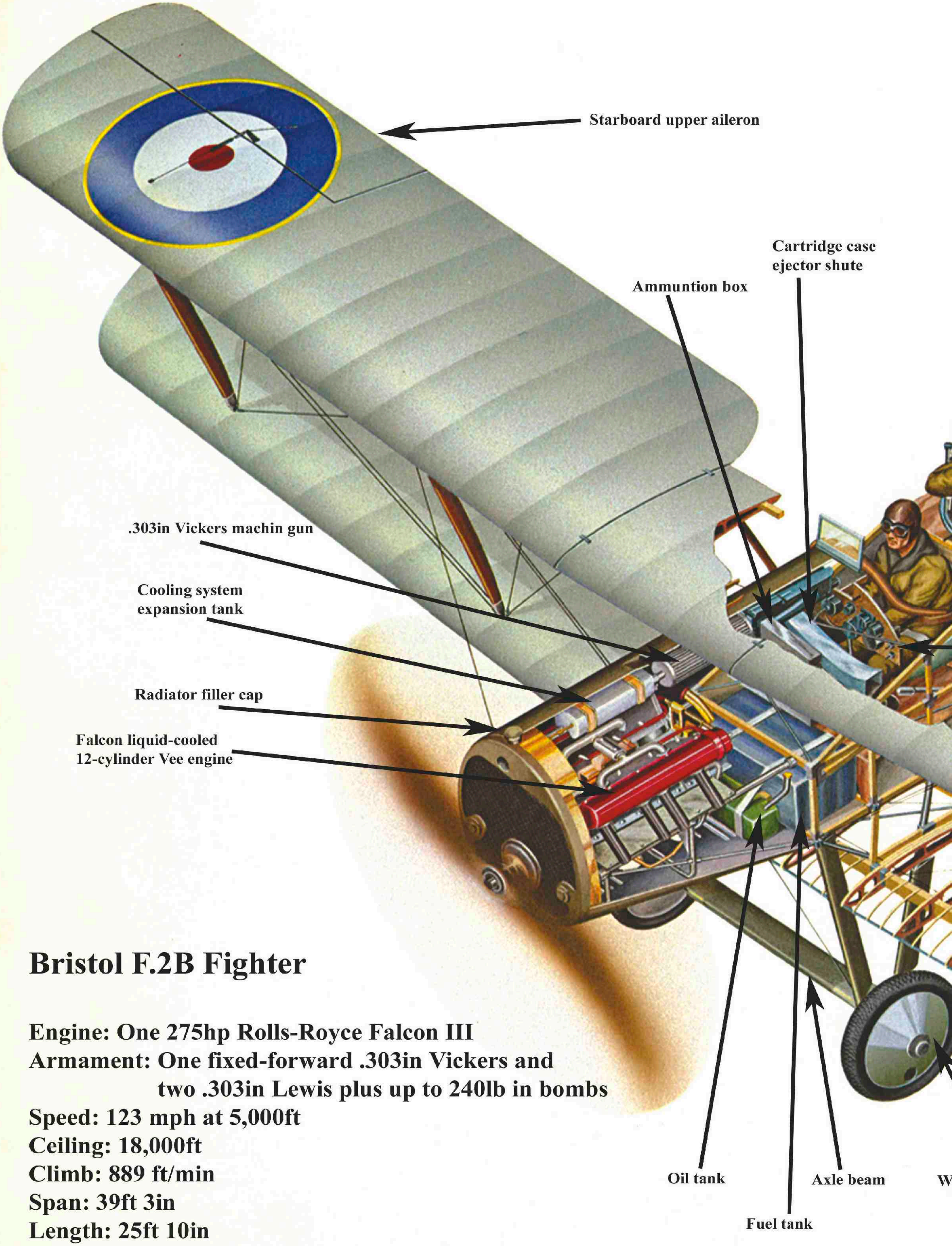
Above: Not one original Fokker Dr.I survives today but thanks to the type'55s association with the 'Red Baron' many replicas, a large number of them flyable, have been built over the years for films or personal use. Even today non-flying replicas are popular thanks to the compact proportions of this agile little fighter. Main: Fokker Dr.I, 139/17 (Fokker works no.1850) pictured during its service with Jasta 5 at Cappy-sur-Somme in May 1918 under the command of Richard Flashar at the beginning of the month and Wilhelm Lehmann at the end.



Pfalz D.IIIa

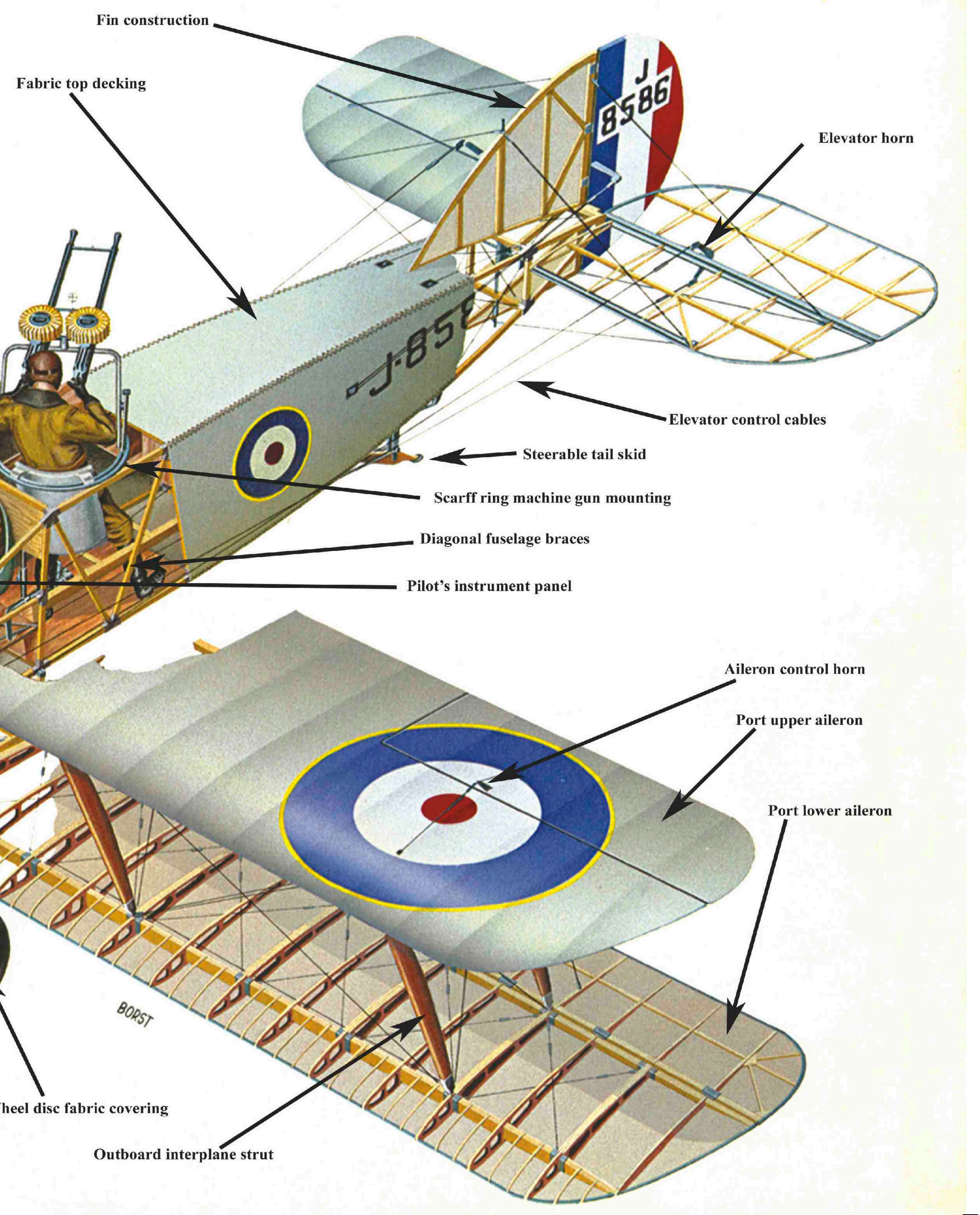
Engine: One 180hp Mercedes D.IIIa
Armament: Two 7.92mm Spandau
Speed: 102.5 mph at 10,000ft
Ceiling: 17,000ft
Climb: 733 ft/min
Span: 30ft 10in
Length: 22ft 10in


ot’s windscreen
tional)
Twin 7.92mm LMG 08/15
Spandau machine guns
Teves & Braun radiator
Mercedes water-cooled in-line
piston engine exhaust manifold
Aileron control lever
ge case
shute
Lower wing
strut fitting
BORST


Starboard upper aileron
Cartridge case ejector shute
Ammuntion box
.303in Vickers machin gun
Cooling system expansion tank
Radiator filler cap
Falcon liquid-cooled 12-cylinder Vee engine
Oil tank
Fuel tank
Axle beam
W

Bristol F.2B Fighter

Engine: One 275hp Rolls-Royce Falcon III
Armament: One fixed-forward .303in Vickers and
two .303in Lewis plus up to 240lb in bombs
Speed: 123 mph at 5,000ft
Ceiling: 18,000ft
Climb: 889 ft/min
Span: 39ft 3in
Length: 25ft 10in


Fin construction
Fabric top decking
J
8586
Elevator horn
J-858
Elevator control cables
Steerable tail skid
Scarff ring machine gun mounting
Diagonal fuselage braces
Pilot’s instrument panel
Aileron control horn
Port upper aileron
Port lower aileron
BORST
heel disc fabric covering
Outboard interplane strut

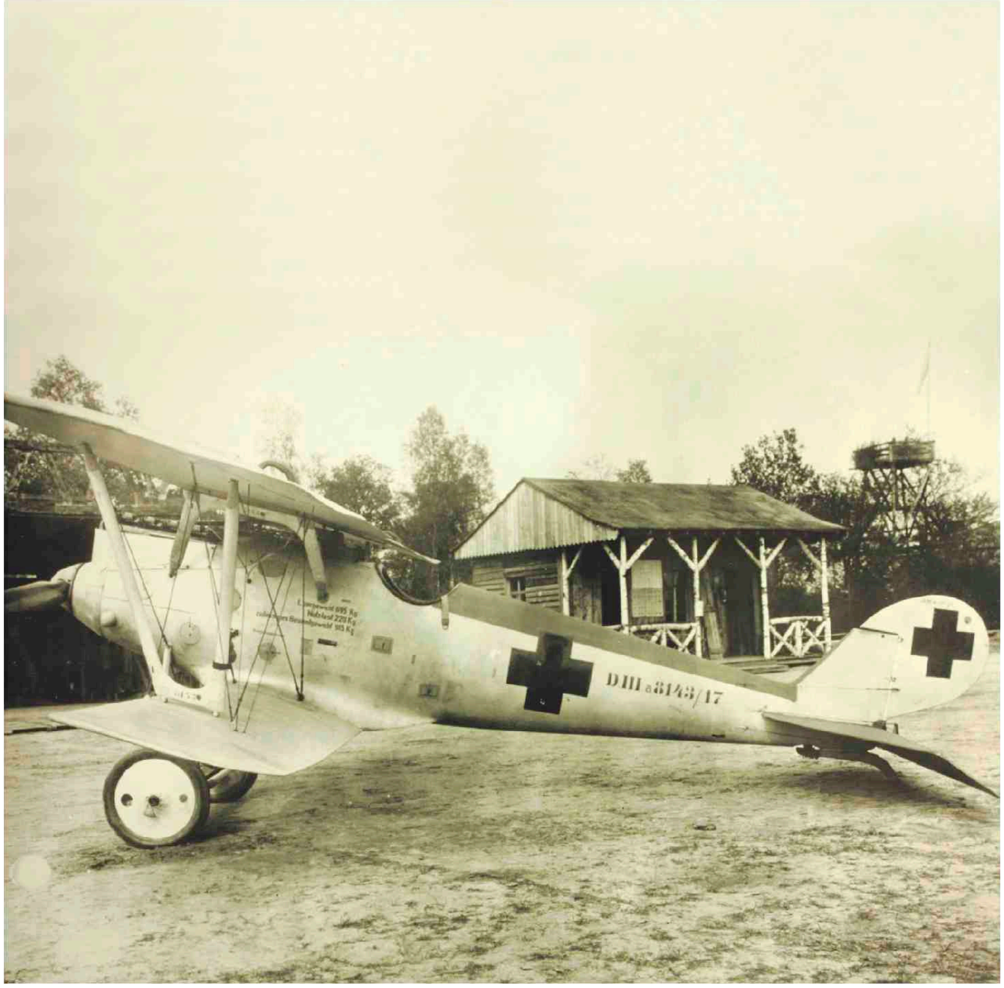
The strong and sturdy Pfalz D.III

ESTABLISHED AT SPEYER-AM-RHEIN in 1913, the Pfalz Flugzeug-Werke GmbH generally built other manufacturers designs under licence right up to 1917. The Pfalz D.III represented the company's first significant original design, the aircraft drawing from experience gained from building the L.F.G Roland D.I and D.II fighters.

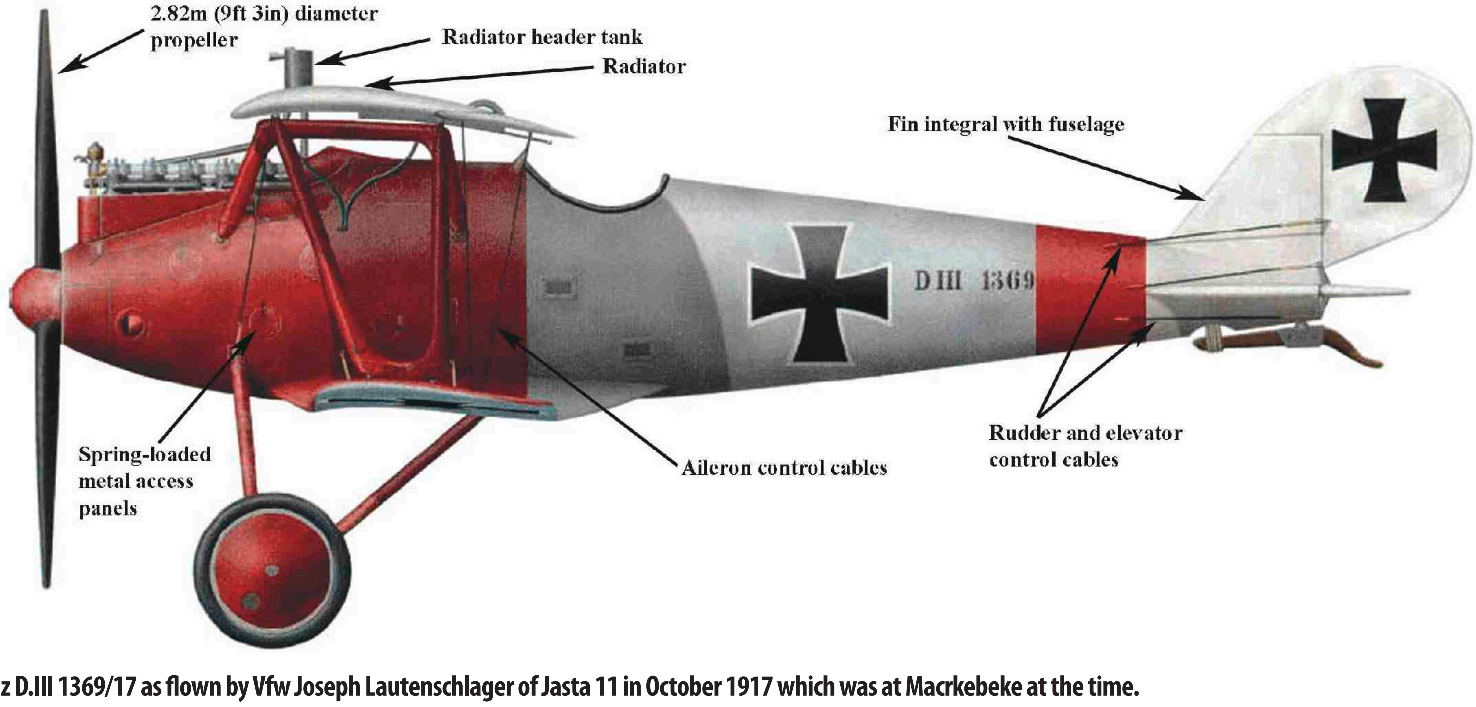
By early 1917, Pfalz had designed its own single-seat fighter under the guidance of Rudolph Gehringer; designated as the D.III the new aircraft first flew in April. An unequal span biplane, the D.III was powered by a 160hp Mercedes D.III inline piston engine. The fuselage was a plywood monocoque which was made in two halves, glued together and then covered in fabric which was doped to add further strength.

The Pfalz D.III entered service with Jasta 10 from August 1917, the new fighter was classed as inferior to the Albatros D.III and D.V. The aircraft had a tendency to slip in turns, had a viscous stall and would enter a spin with little encouragement. The latter trait was soon used to a pilot's advantage as a quick way of evading an enemy aircraft.

The D.IIIa followed in early 1918, the aircraft featuring a more powerful engine and re-positioned accessible machine-guns which were buried in the fuselage of the original fighter. Approximately 260 D.III and 750 D.IIIa were built up to May 1918. Over 400 were still operational over the Western Front by the end of April 1918 and while many were withdrawn for training purposes, at least 100 remained in the front line until the end of the war.

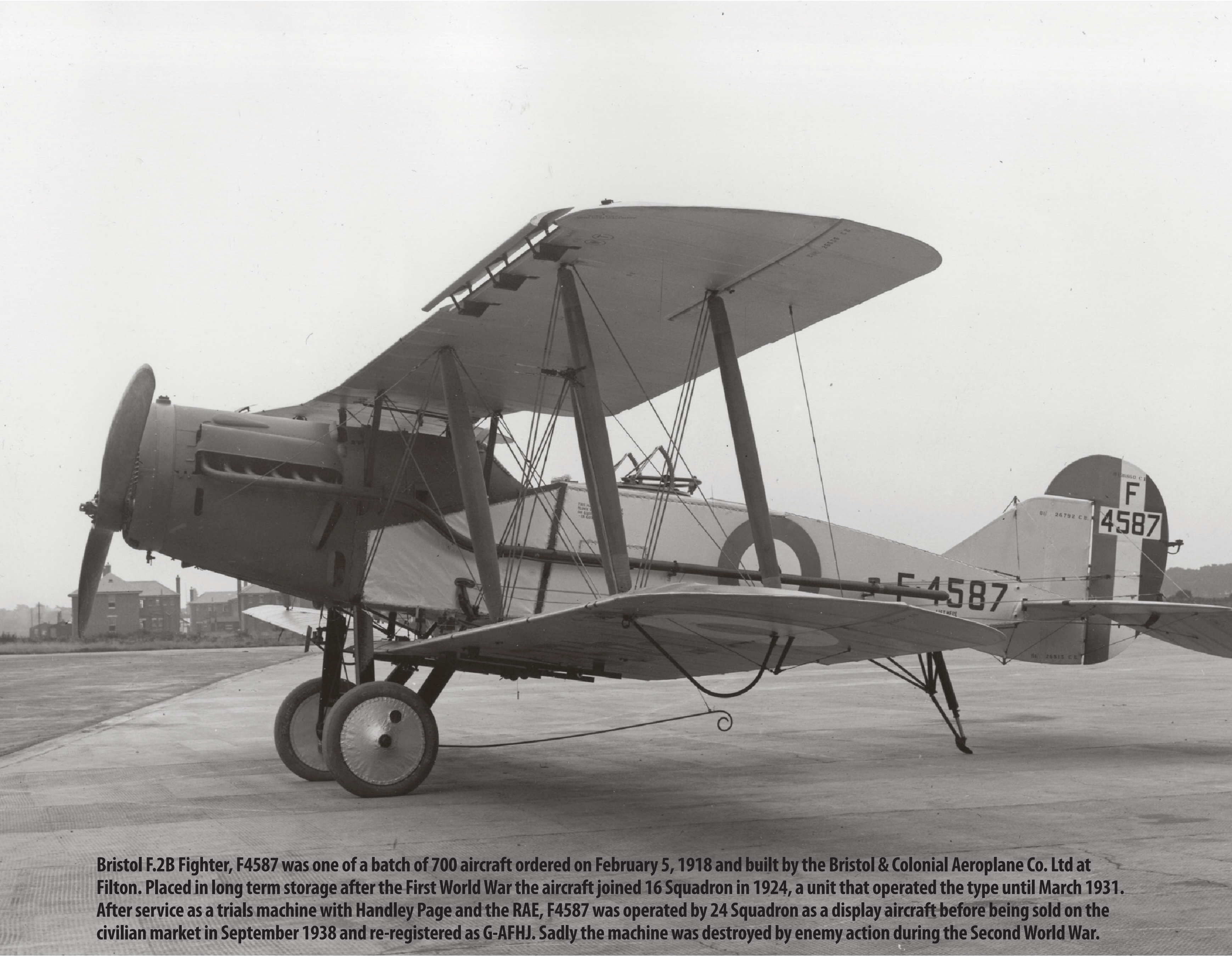


Pfalz D.IIIa 8143/17 pictured in April 1918 when it was being flown by Oblt Walter Ewers, the commanding officer of Jasta 77 based at Vraignes.


2.82m (9ft 3in) diameter propeller
Radiator header tank
Radiator
Fin integral with fuselage
D III 1369
Spring-loaded metal access panels
Aileron control cables
Rudder and elevator control cables

Pfalz D.III 1369/17 as flown by Vfw Joseph Lautenschlager of Jasta 11 in October 1917 which was at Macrkebeke at the time.

Burying the memory of the B.E.2; the Bristol F.2B Fighter, aka the 'Brisfit'



Bristol F.2B Fighter, F4587 was one of a batch of 700 aircraft ordered on February 5, 1918 and built by the Bristol & Colonial Aeroplane Co. Ltd at Filton. Placed in long term storage after the First World War the aircraft joined 16 Squadron in 1924, a unit that operated the type until March 1931. After service as a trials machine with Handley Page and the RAE, F4587 was operated by 24 Squadron as a display aircraft before being sold on the civilian market in September 1938 and re-registered as G-AFHJ. Sadly the machine was destroyed by enemy action during the Second World War.

BRISTOL'S CHIEF DESIGNER, Frank Barnwell added the final touches to the design of a two-seat reconnaissance aircraft, which in competition with the RAF RE.8 would be the long overdue replacement for the B.E.2 in March 1916. The original variant was the Type 12 F.2A of which only 52 were built; the type having an inauspicious entry into combat when in April 1917, a patrol of six aircraft was reduced to two survivors when they encountered Richthofen's Jasta 11. The losses were no fault of the aircraft, but of the poor tactics employed and, with the introduction of the definitive Type 14 F.2B Fighter it was realised that 'Brisfit' could be thrown around like many of its contemporary fighters. With a higher-powered Falcon engine than the F.2A, the F.2B was more than 10mph faster with a maximum speed of 123mph and could reach 10,000ft three minutes quicker than its predecessor. Making full use of the fixed-forward firing machine-gun instead of relying upon the gunner in the rear cockpit, made the 'Brisfit' a tough opponent to any German fighter right up to the end of the First World War.

The F.2B remained in RAF service right up to 1932 and also saw service in Australia, Belgium, Canada, Ireland, Greece, Mexico, New Zealand, Norway, Peru and Spain. A total of 5,329 'Brisfits' were built by the Bristol & Colonial Aeroplane Co. Ltd. at Filton and a host of sub-contractors.

▶ **Capt Syd Addison and his gunner Lt Wilmot Hudson Fysh of 1 Squadron, Australian Flying Corps pose for the camera whilst serving at Mejdel, Palestine. Addison and Fysh shared an Albatros D.V shot down on January 23, 1918 and whilst flying with Lt Paul J McGinness, Fysh scored a further four victories. Post-war Fysh and McGinness went on to form Queensland and Northern Territories Air Service (QANTAS).**

BRISTOL F.2B TECHNICAL INFORMATION

FIRST FLIGHT: October 25, 1916

ENGINE: One 275hp Rolls-Royce Falcon III

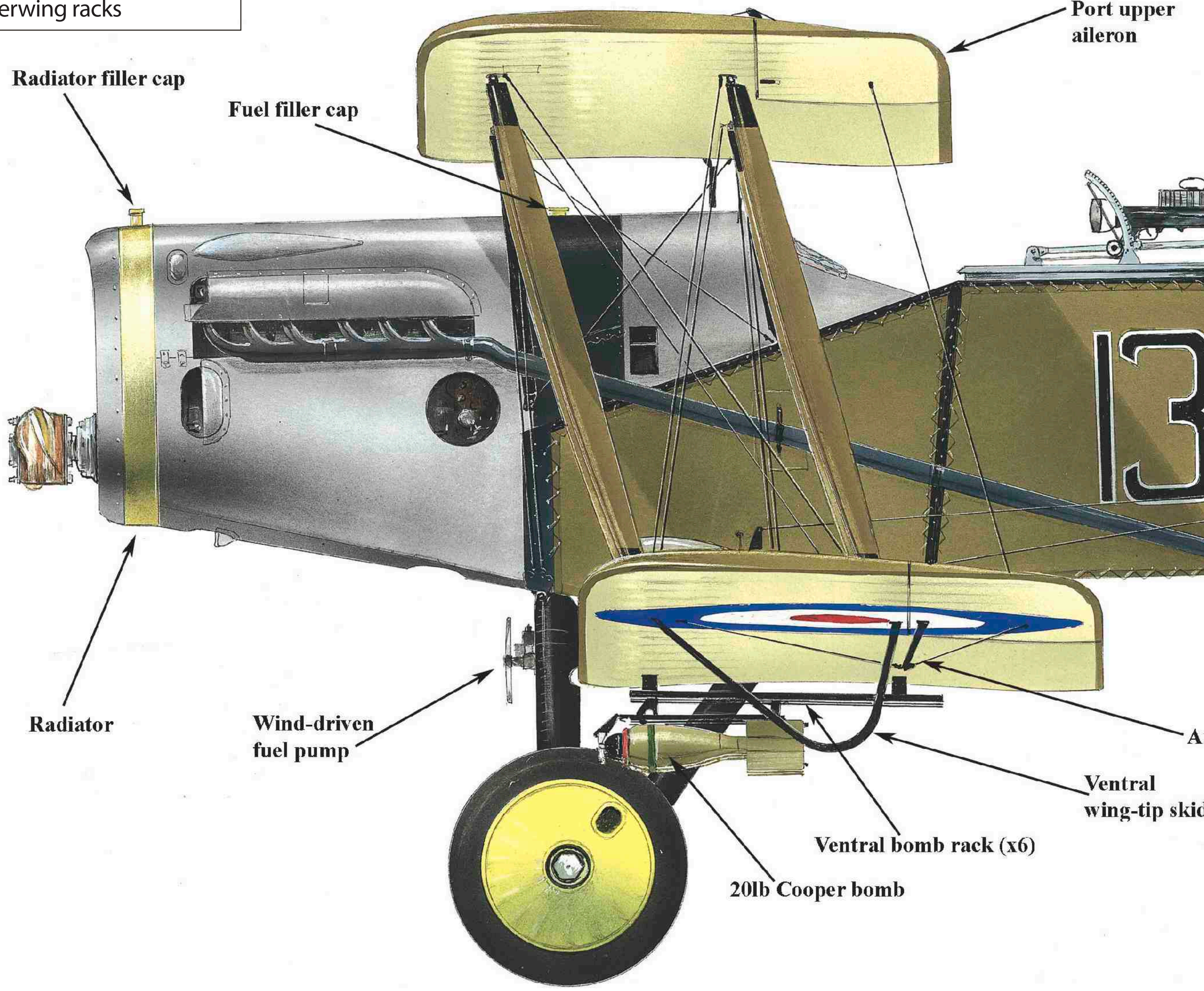
SPAN: 39ft 3in

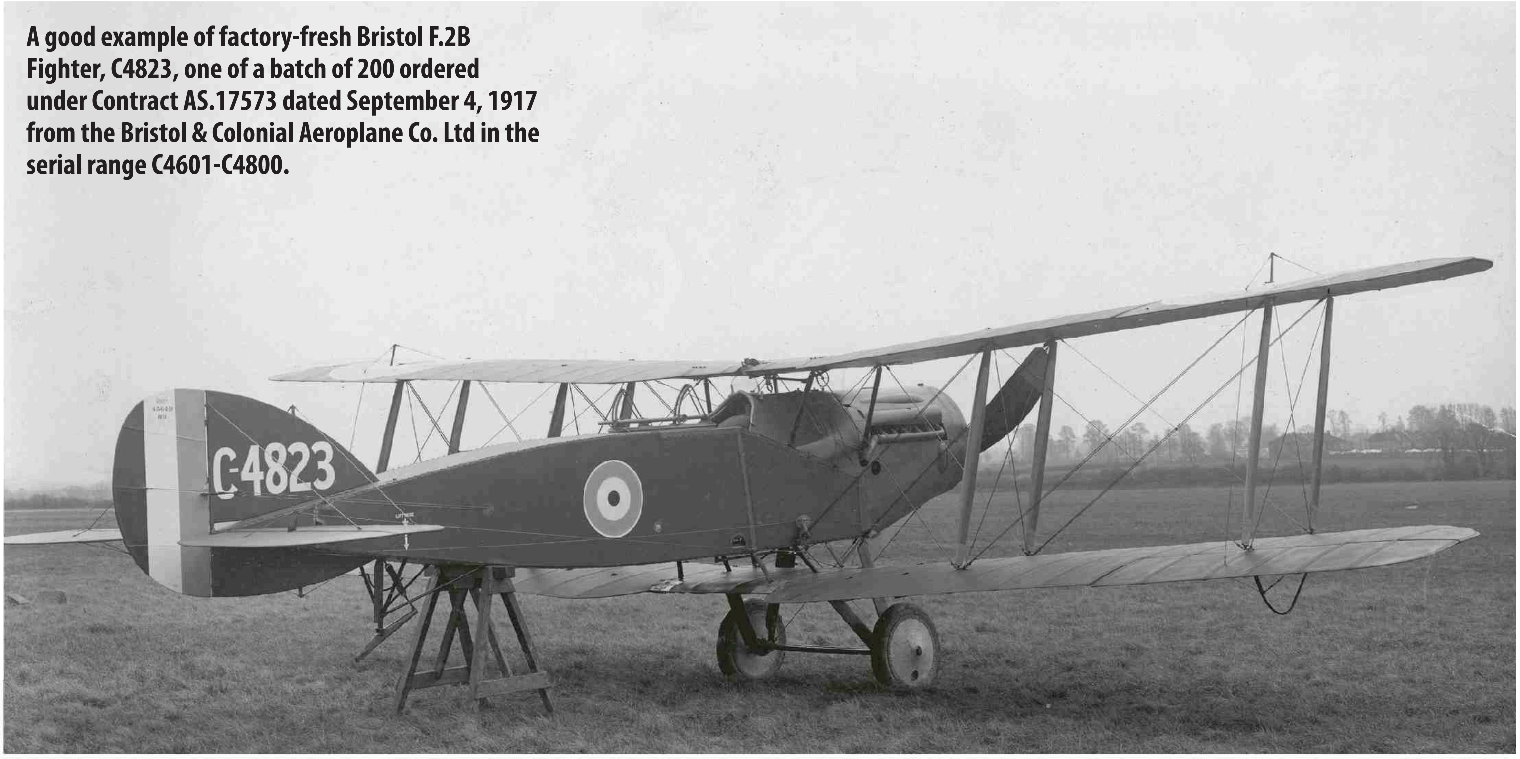
LENGTH: 25ft 10in

MAX SPEED: 123mph at 5,000ft

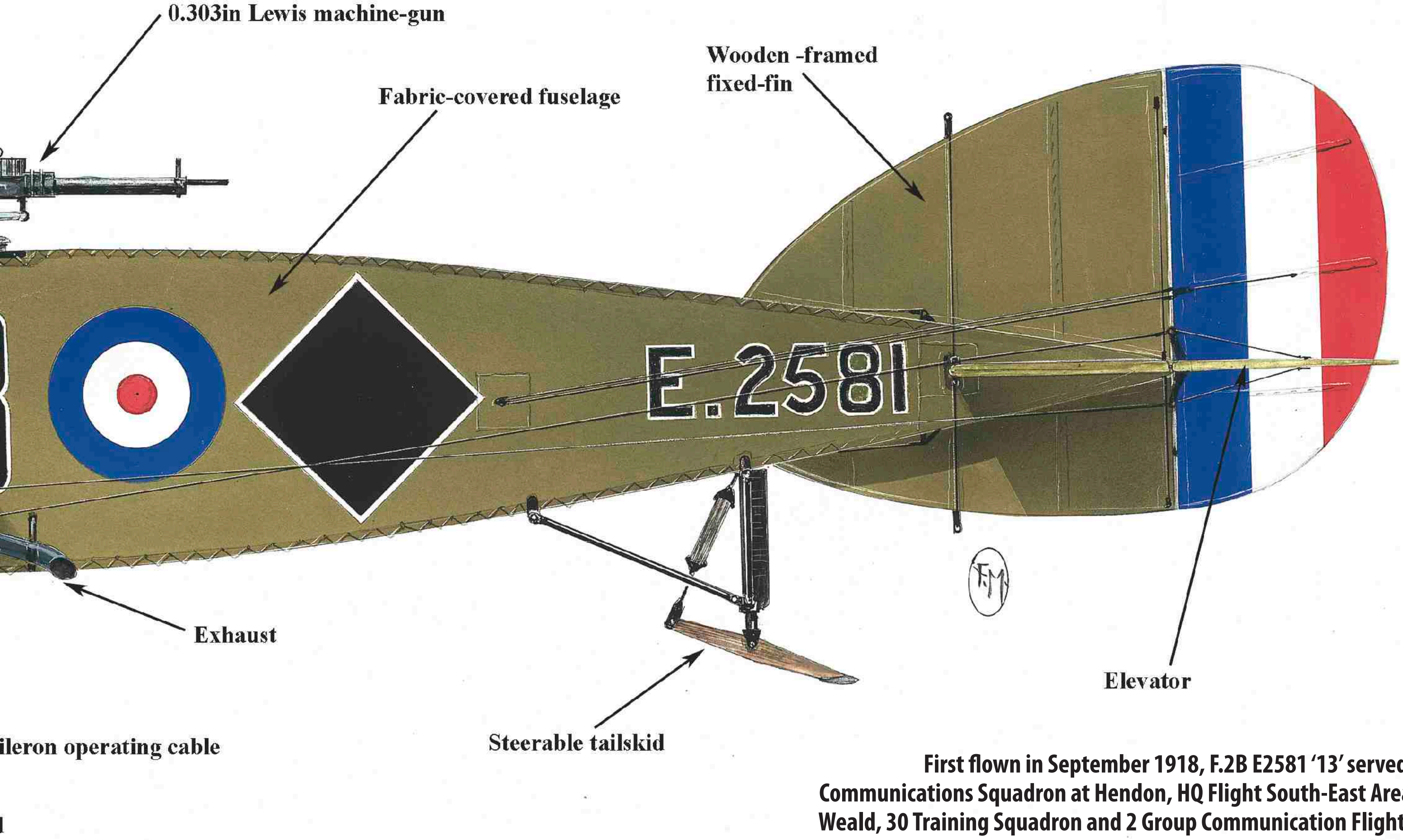
CREW: Two, one pilot and one observer/air gunner

ARMAMENT: One fixed forward-firing .303in (7.7mm) synchronised Vickers machine-gun and one or two .303in (7.7mm) Lewis machine-guns in the rear cockpit; up to twelve 20lb bombs on underwing racks





A good example of factory-fresh Bristol F.2B Fighter, C4823, one of a batch of 200 ordered under Contract AS.17573 dated September 4, 1917 from the Bristol & Colonial Aeroplane Co. Ltd in the serial range C4601-C4800.



First flown in September 1918, F.2B E2581 '13' served with 1 Communications Squadron at Hendon, HQ Flight South-East Area North Weald, 30 Training Squadron and 2 Group Communication Flight before it was retired in April 1920. Earmarked for preservation the 'Brisfit' spent many years in the IWM at Lambeth before being moved to Duxford in 1984, where it remains today.

A prophetic fighter design; the Bristol M.1 Monoplane Scout

DESIGNED IN RESPONSE to successes achieved by the Fokker E type monoplanes against the RFC's poorly armed biplanes, the Bristol M.1 Monoplane Scout was a Frank Barnwell design that was ahead of its time and completely unappreciated during the First World War. The entire aircraft was designed around a closely-cowled radial engine, the diameter of which dictated the size of the fuselage to make the machine as streamlined as possible.

The first in the series, the M.1A carried out its maiden flight on July 14, 1916 in the hands of F P Raynham. During trials at the CFS (Central Flying School) the aircraft performed well and a tentative order for another M.1A and four M.1Bs was placed. The latter were delivered from December 1916, powered by various engines and again were all trialled at the CFS and also by 50 (March 1917) and 111 Squadrons. A landing speed of just 49mph was still deemed too high to operate from the small French airfields of the Western Front. A further more substantial order for 125 aircraft was placed in August 1917 for a main production variant designated as the M.1C. Virtually all were relegated to units operating in the Middle East including 47 (February to May 1918), 63 (January to December 1919), 72 (March 1918 to February 1919) and 150 (April 1918 to February 1919) Squadrons.

BRISTOL M.1C MONOPLANE SCOUT TECHNICAL INFORMATION

FIRST FLIGHT: September, 1917 by F P Raynham

ENGINE: One 110hp Le Rhône 9J

SPAN: 30ft 9in

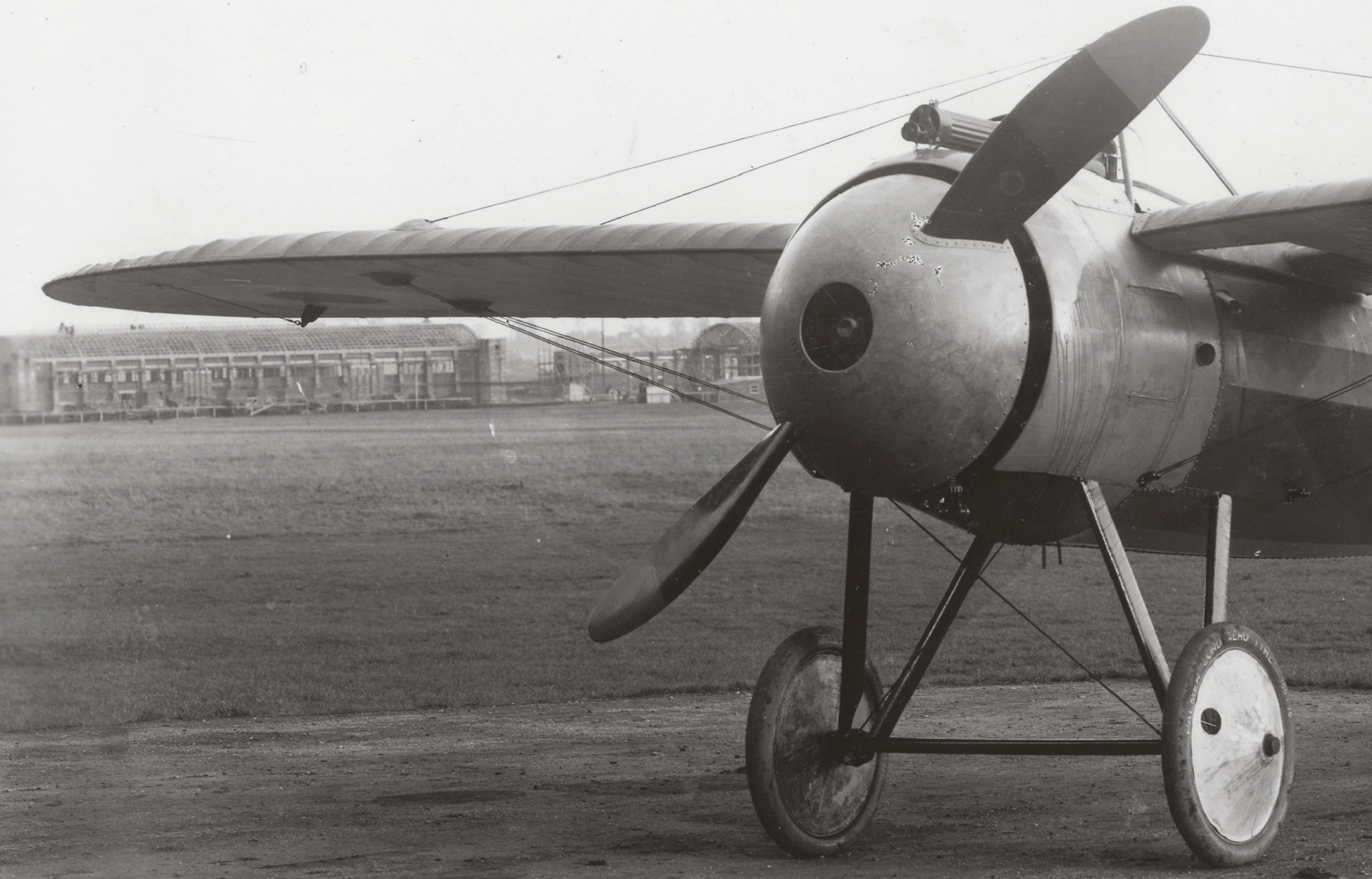
LENGTH: 20ft 5.5in

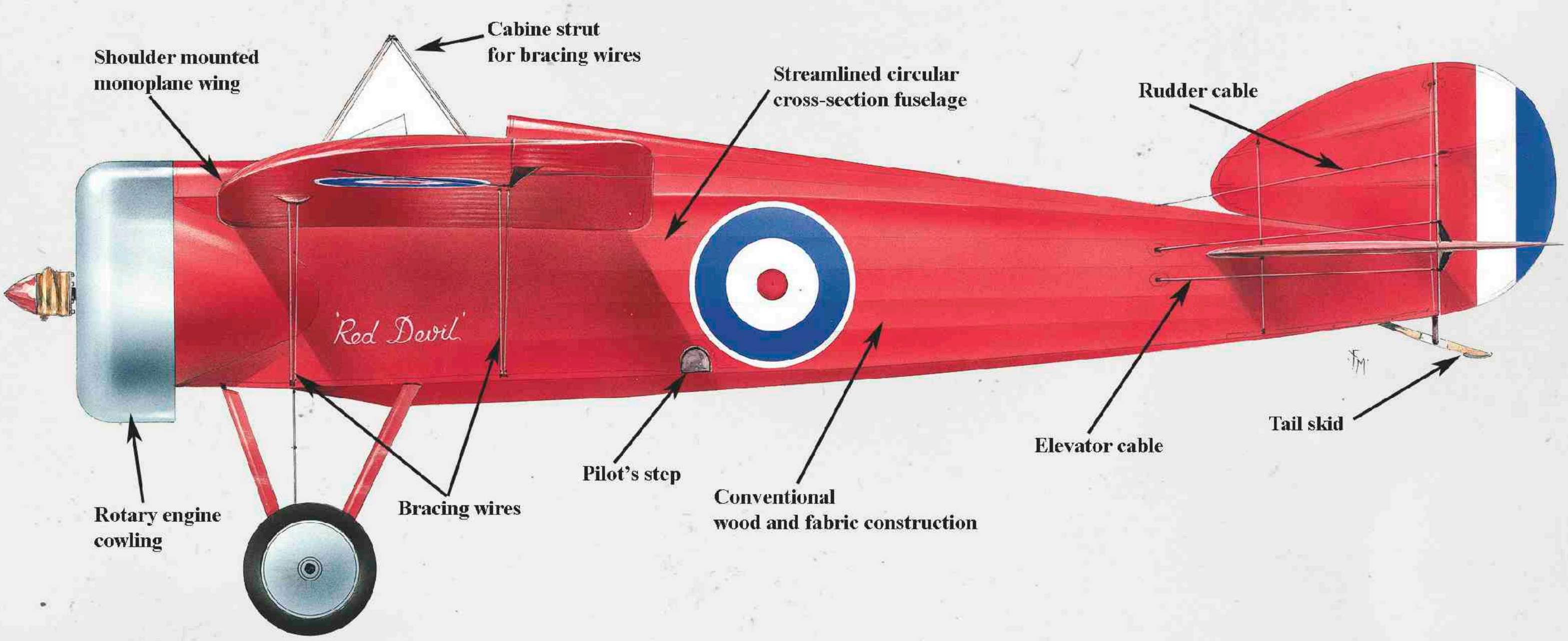
MAX SPEED: 130mph at sea level

CREW: One

ARMAMENT: One fixed forward-firing .303in synchronised Vickers machine-gun

130 M.1 Monoplane Scouts were built, all by the Bristol & Colonial Aeroplane Co. Ltd. Two were M.1As, four M.1B, 125 M.1C and a single M.1D; the latter being a conversion of a M.1B rebuilt in 1922 with a 100hp Bristol Lucifer radial engine. The type saw limited service with RAF from February 1918 through to December 1919 with operational squadrons and only slightly longer with a few second-line units.





Six M.1Cs were converted for civilian use after the First World War including Capt Harry Butler's monoplane, purchased from the Aircraft Disposals Board in July 1919 and shipped to Australia. In September 1920 Butler flew the monoplane to victory in the Australian Aerial Derby. The aircraft was preserved and is on display at Minlaton near Adelaide.

Flying-boats for the world's navies; the FBA Type H Flying-boat

THE FRANCO-BRITISH AVIATION (FBA) was established in 1913 by Louis Schreck and André Beaumont, specialising in producing small flying-boats for the navies of Britain, France, Italy and Russia. The company's headquarters were based in London, while aircraft production was carried out in Paris until the end of the war when the company was renamed Hydravions Louis Schreck FBA and was based solely in France.

FBA's most successful aircraft was, by far the Type H; a simply designed pusher biplane powered by a water-cooled engine. Some Type Hs were powered by a 150 or 170hp Hispano-Suiza 8A while others were propelled by a 160hp Lorraine 8N. A two bay biplane, the hull of the Type H had single step while two crew sat side-by-side in an open cockpit and a third served as an air gunner in his own cockpit in the nose.

Operated by many air arms during the First World War, the majority served the French and Italian forces; four from the latter powered by Isotta Fraschini engines briefly served with the Royal Navy in a training role. Approximately 2,000 FBA Type Hs were built, making it by far the most successful flying-boat in the company's history.

FBA TYPE H (HISPANO 8A) TECHNICAL INFORMATION

FIRST FLIGHT: 1917

ENGINE: One 150hp Hispano-Suiza 8Aa

SPAN: 48ft 4in

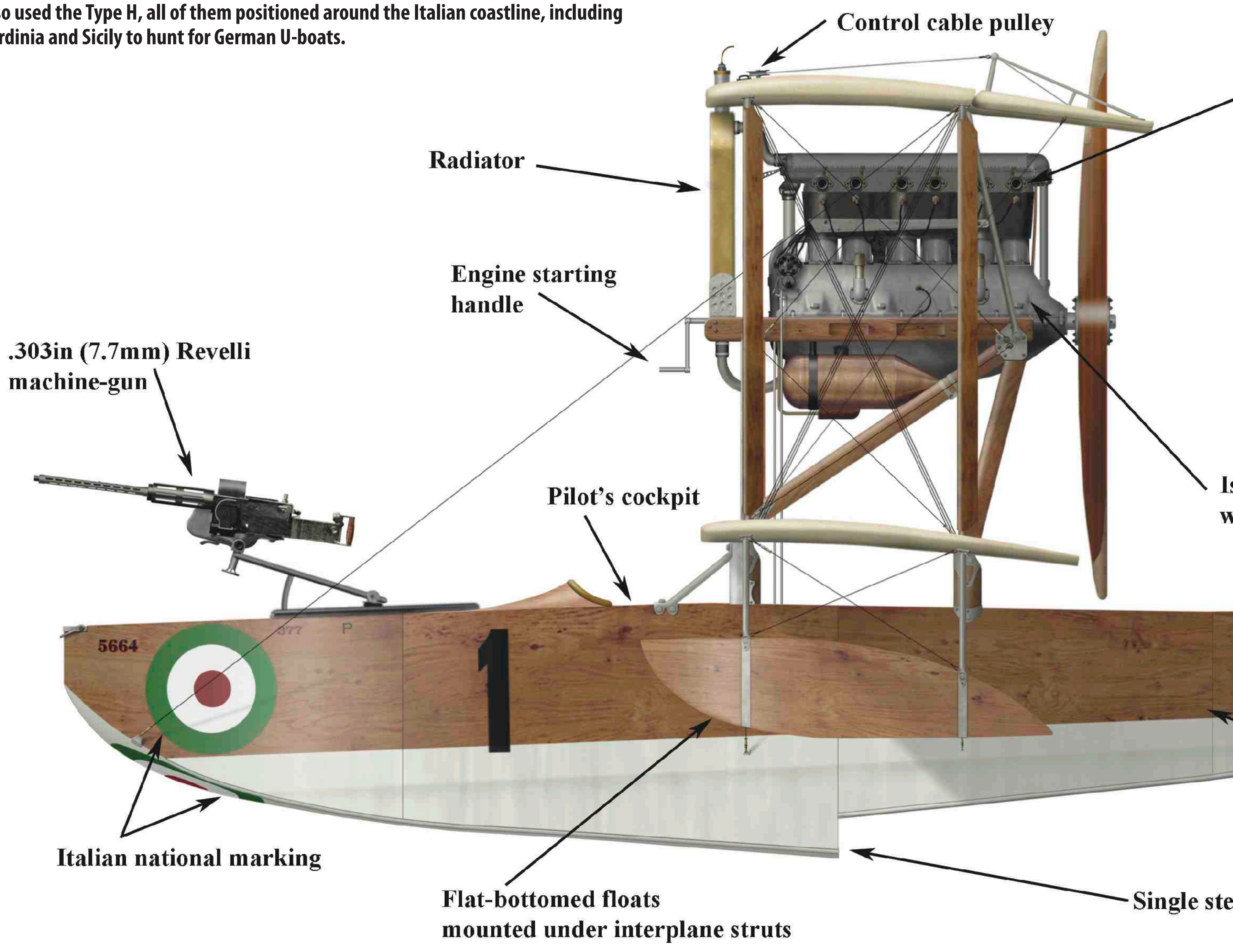
LENGTH: 32ft 7in

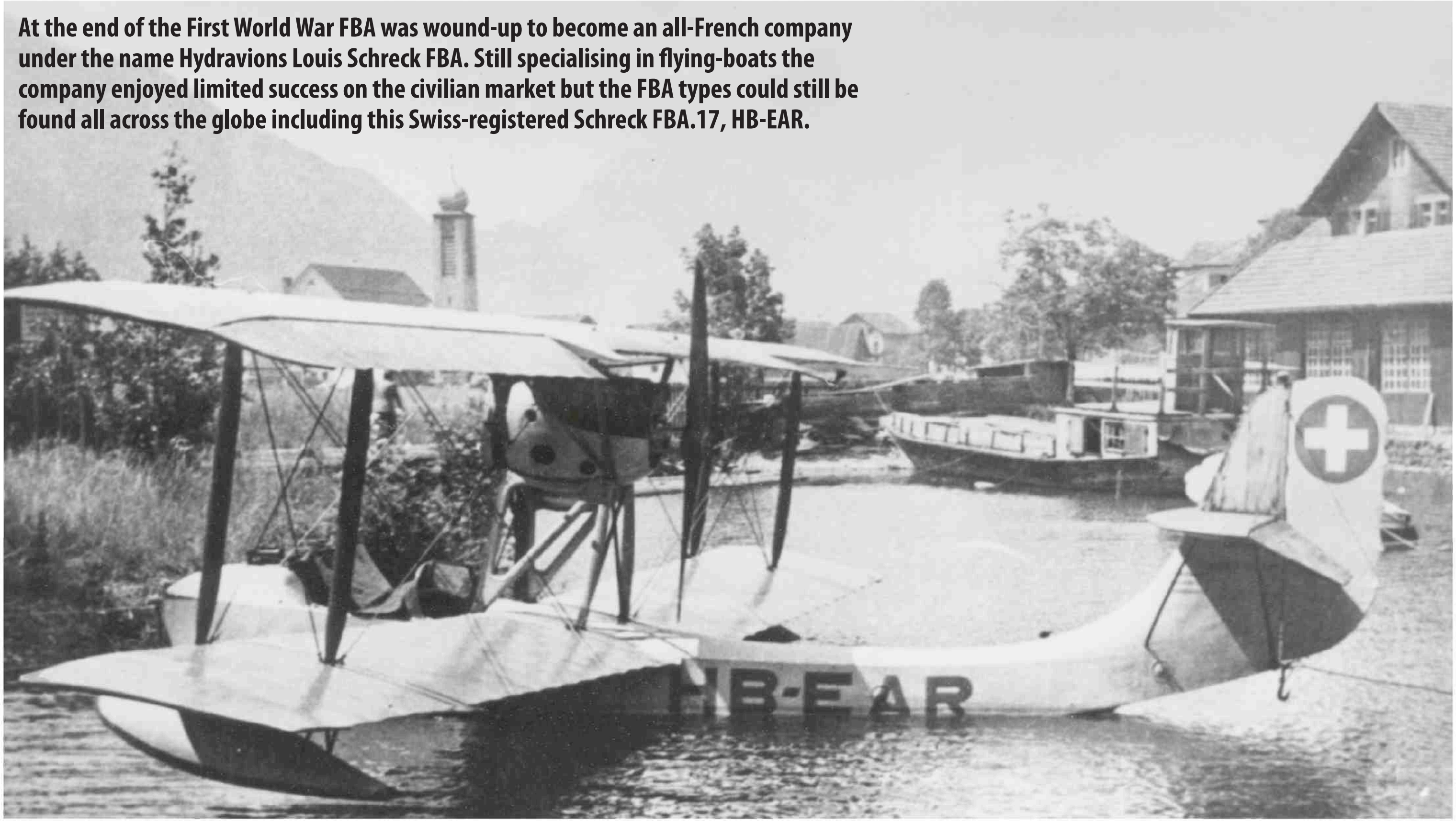
MAX SPEED: 90mph

CREW: Three, one pilot and a pair of observer/air gunners

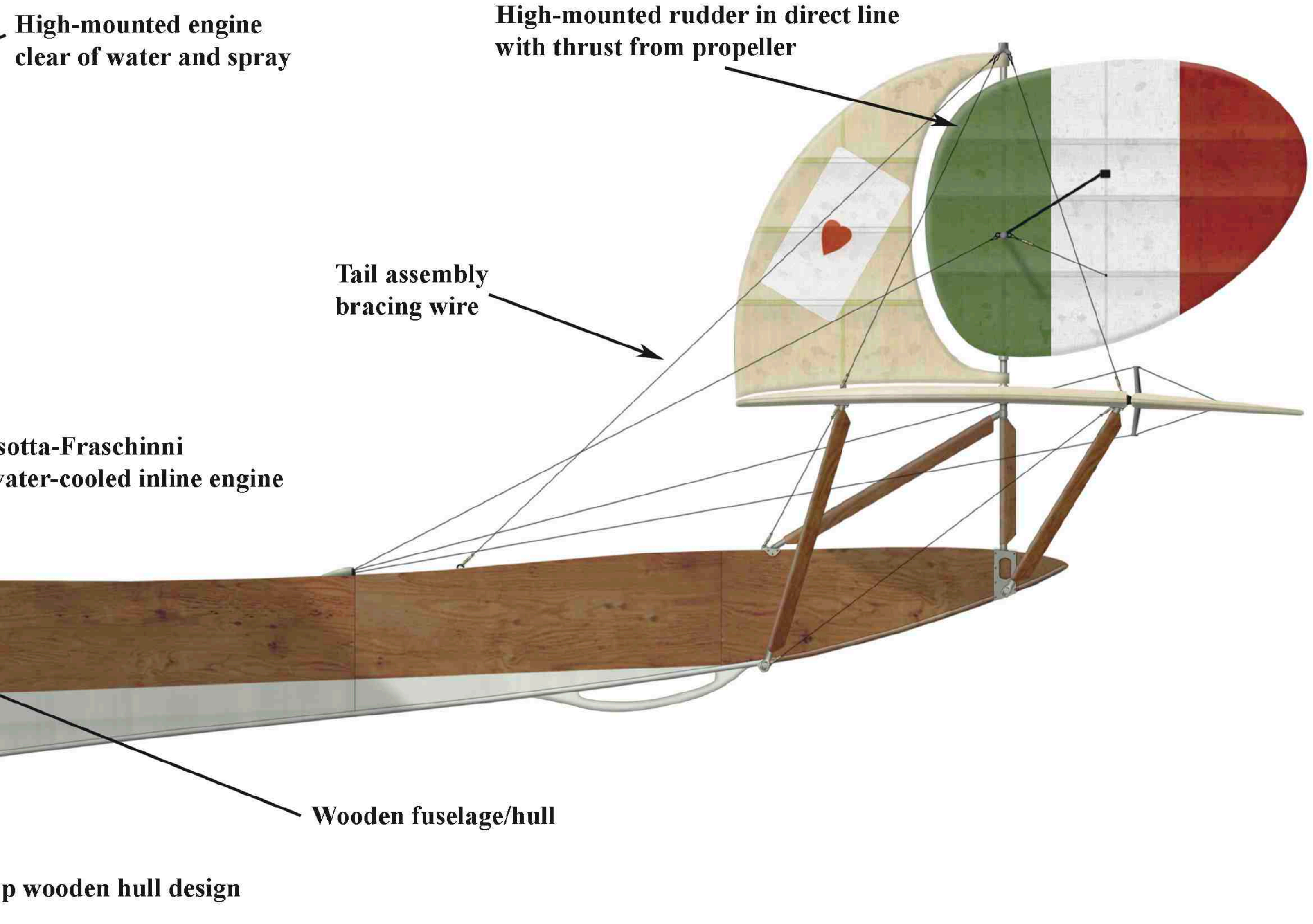
ARMAMENT: One .303in (7.7mm) Lewis machine-gun fixed or mounted in nose position and up to 440lb of bombs

The Italian armed forces were large users of the FBA Type H which was built in the country by SIAI (Sesto Calende), CIVES (Varazze), Ductot (Palermo), Gallinari (Pisa), IAM (Naples) and Savoia & Zari (Milan) between 1916 and 1918. The type served at nine different Italian Naval Air Stations and equipped two Army seaplane squadrons on Lake Garda and Iseo. 21 Coastal Defence Flights which were later upgraded to squadrons also used the Type H, all of them positioned around the Italian coastline, including Sardinia and Sicily to hunt for German U-boats.





At the end of the First World War FBA was wound-up to become an all-French company under the name Hydravions Louis Schreck FBA. Still specialising in flying-boats the company enjoyed limited success on the civilian market but the FBA types could still be found all across the globe including this Swiss-registered Schreck FBA.17, HB-EAR.


High-mounted engine
clear of water and spray
High-mounted rudder in direct line with thrust from propeller
Tail assembly bracing wire
sotta-Fraschinni
vater-cooled inline engine
Wooden fuselage/hull
p wooden hull design

The finest British fighter of the First World War; the Sopwith Camel

A REPLACEMENT FOR the Sopwith Pup over the Western Front, the superb Camel was an outstanding fighter which is officially credited with shooting down 1,294 enemy aircraft and unofficially nearly 3,000!

A direct development of the Pup, the Camel was a heavier machine with a more powerful engine. The latter, along with the pilot, fuel and armament were concentrated into a very small area which gave the aircraft outstanding manoeuvrability, which when harnessed with experience was unrivalled by any opponent. Thanks to the right-hand torque of the engine, snap turns to starboard could be performed in the blink of an eye. It was actually quicker to make a 90° turn to port by performing a three-quarter (270°) turn to starboard!

The Camel first entered service with 4 Squadron RNAS in June 1917 and in July also joined the RFC for the first time with 70 Squadron. Along with the SE.5a and the SPAD S.XIII the Camel helped to re-establish Allied air superiority until the middle of 1918. The type was also used for Home Defence and as a night fighter and it proved particularly effective against enemy Gothas from July 1917. The Camel was also usefully employed as a ground attack aircraft, dropping 25lb Cooper bombs and strafing enemy troops but would suffer the very same high losses that it managed to inflict on the enemy.

5,290 Camels were built in total and during its service the aircraft served with 50 RFC squadrons, eight RNAS squadrons, plus extensive service with the Australian Flying Corp, the Belgian Groupe de Chasses and four aero squadrons of the American Expeditionary Force.

SOPWITH F.1 CAMEL TECHNICAL INFORMATION

FIRST FLIGHT: Dec 22, 1916

ENGINE: One 130hp Le Clerget

SPAN: 28ft

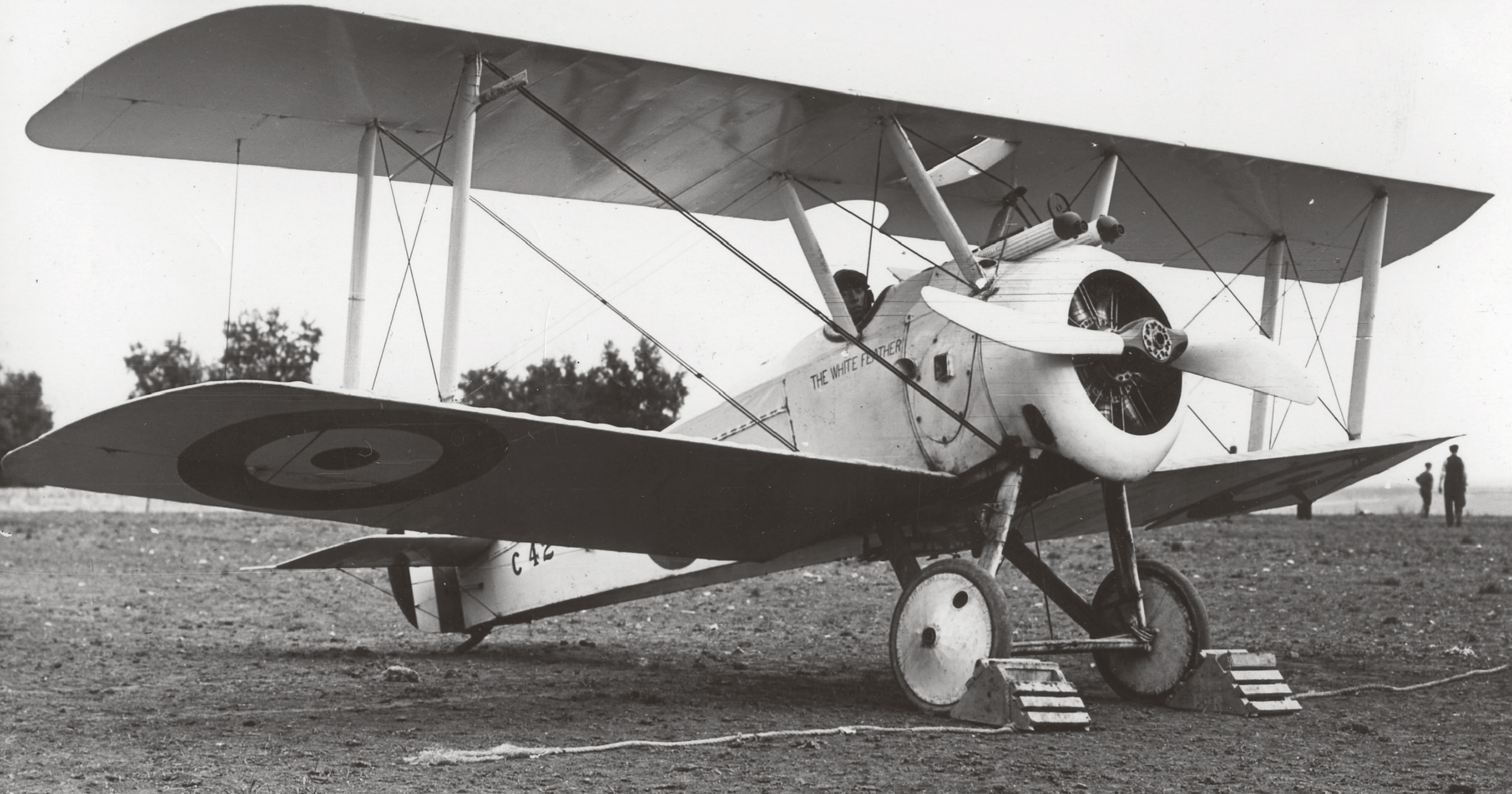
LENGTH: 18ft 9in

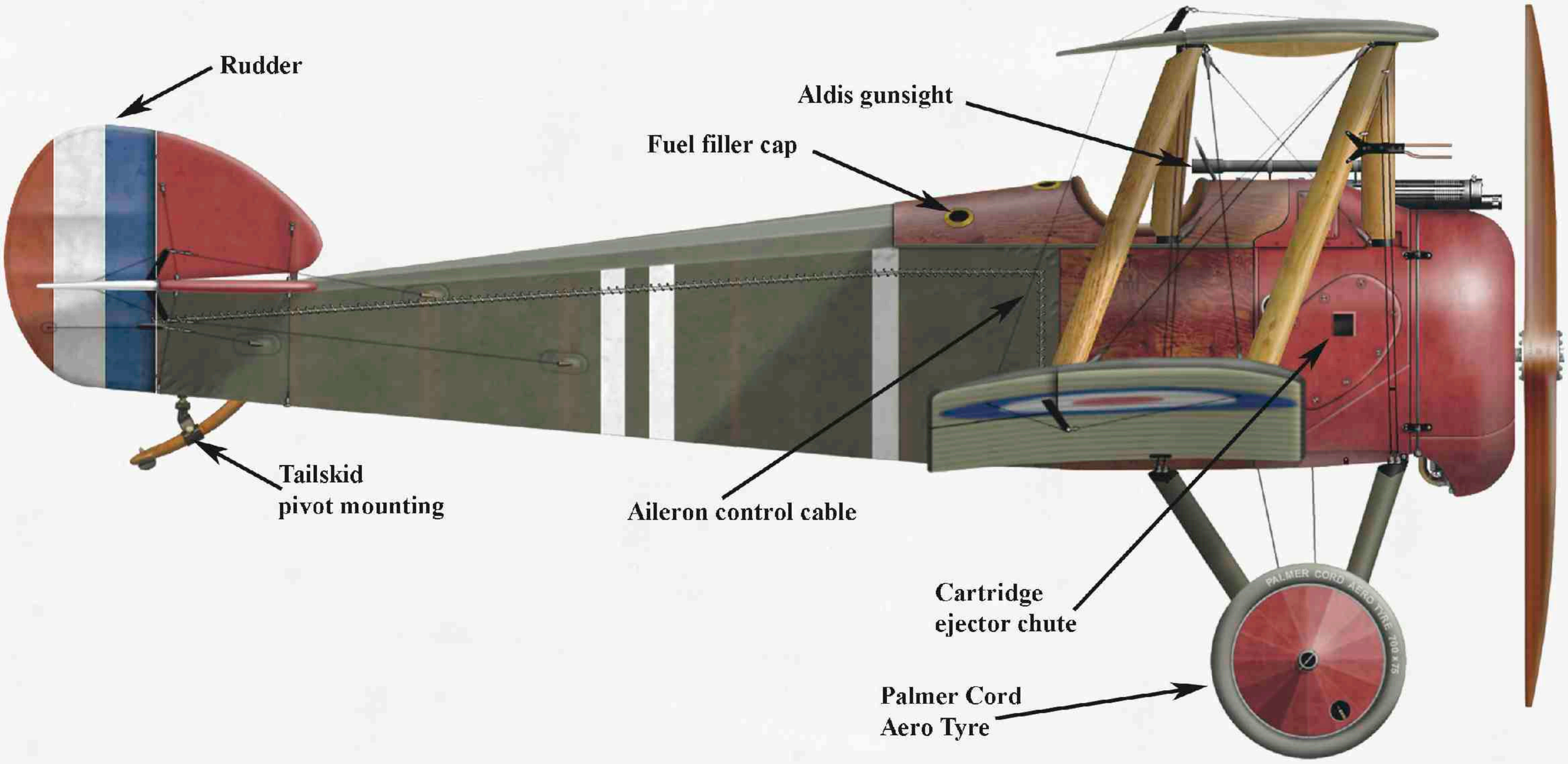
MAX SPEED: 115mph at 6,500ft

CREW: One

ARMAMENT: Two forward-firing synchronised .303in (7.7mm) Vickers machine-guns and up to four 25lb bombs carried externally

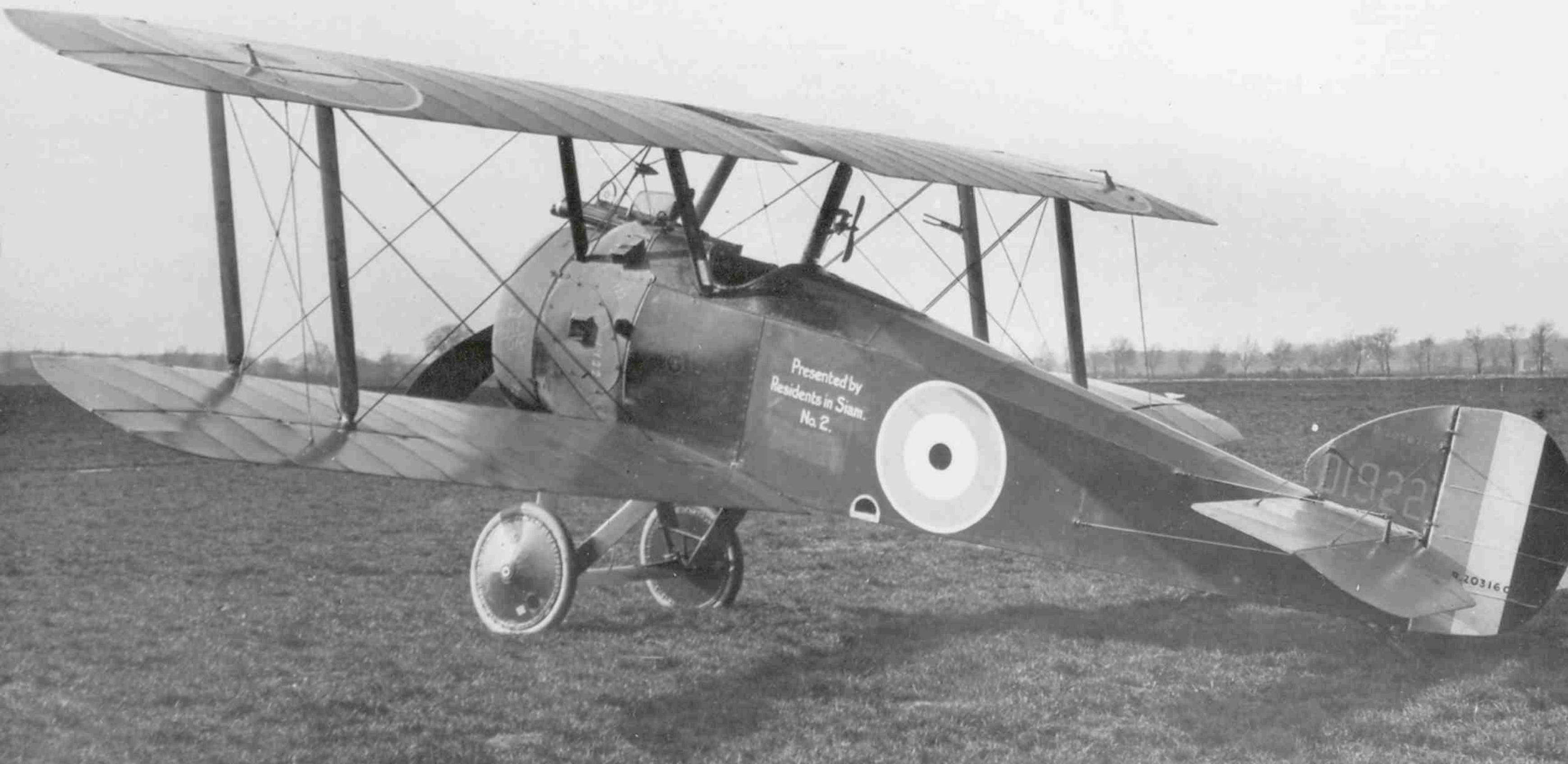
Sopwith F.1 Camel C42 built by Nieuport & General Aircraft Co. Ltd of Cricklewood served with 226 Squadron were the name 'The White Feather' was applied. The aircraft was later converted into a two-seater and saw service with the CFS at Upavon and the SoAF&G (School of Aerial Fighting & Gunnery) at Leuchars.



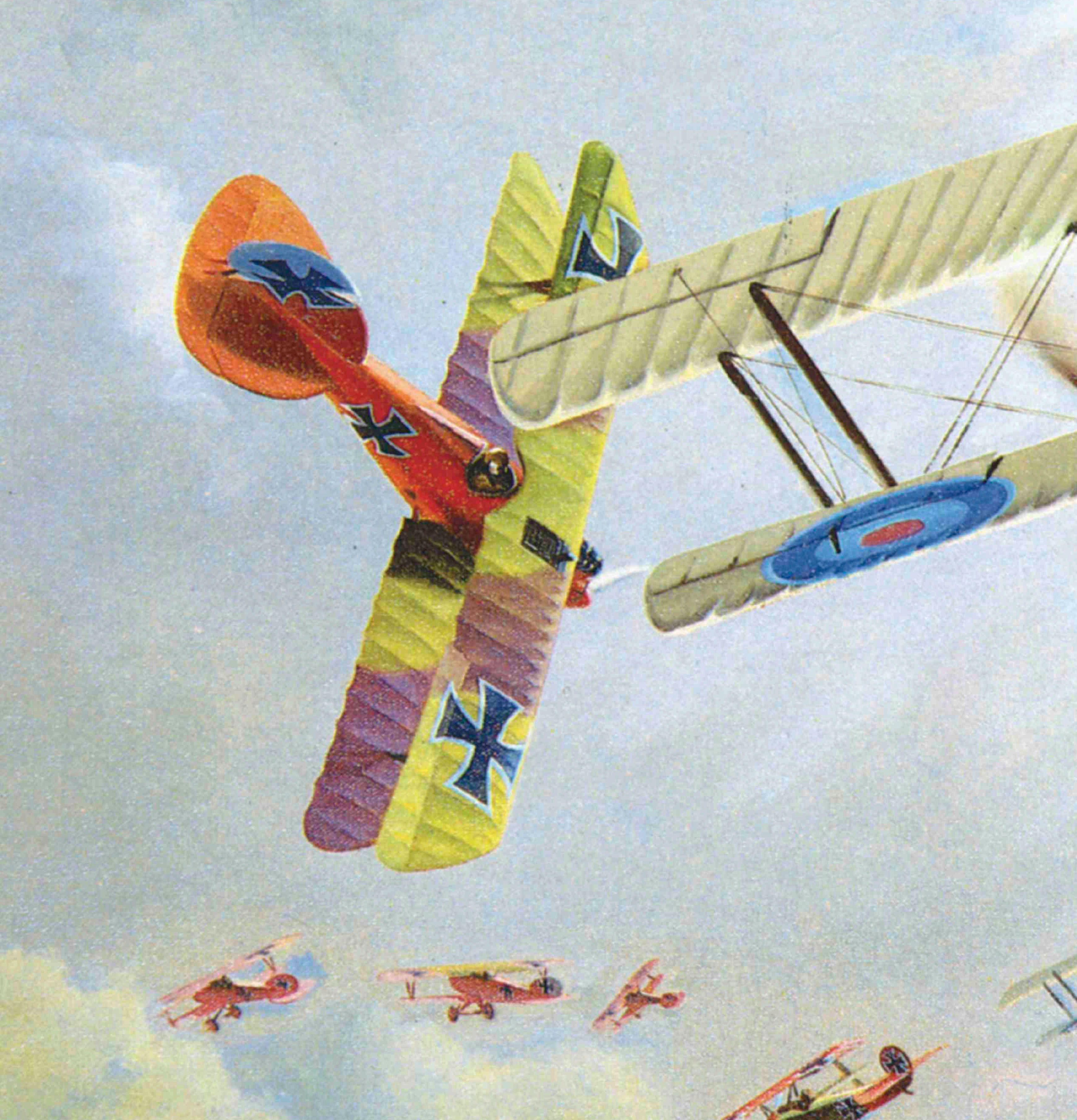


▲ The 209 Squadron Sopwith F.1 Camel, B7270 flown by Capt Arthur Roy Brown, DSC who was officially credited, by the RAF, with bringing down Manfred von Richthofen on April 21, 1918. However, it is believed that Richthofen was more likely hit by ground fire.

▼ One of many presentation Camels was D1922 which was 'Presented by Residents of Siam in early 1918. The aircraft joined 73 Squadron on May 23, 1918 and before its loss in September 1918, the Camel claimed three Fokker D.VIIIs, a single Fokker Dr.I and an unidentified two-seater all in the hands of Lt R N Chandler.



Capt A H Cobby DSO, DFC** flies into action with 4 Squadron Australian Flying Corp in battle against an enemy circus on March 21, 1918. By the end of the encounter Cobby had two Albatros D.Vs to his credit, both of them crashing south of Brebieres. Cobby ended the First World War with 29 enemy aircraft and 13 observation balloons to his credit.



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A

The Imperial German strategic bomber; the Gotha G.IV

DEVELOPMENT OF THE GOTHA series of twin-engine bombers began in 1915 starting with the G.II and G.III which were both built in small numbers. Flight and combat experience whilst operating over Western Europe brought about a number of changes into the next variant, the longer-range G.IV.

Constructed of wood and steel, the G.IV was covered with a combination of plywood and fabric. The G.IV was a three-bay biplane, with a square-section fuselage, a braced tail unit with tailskid and a main double-wheeled undercarriage.

The G.IV entered service in March 1917 with Kagohl 1(later redesignated Kagohl 3) and within a short space of time the bombers were employed in Operation Türkenkreuz, the bombing of London which began on June 13, 1917. Prior to this, the first Gotha raids had already been carried out from May 25 when 21 attacked Folkestone and Shorncliffe. The first raid on London killed 162 people and injured 432 in what was to become the largest number of fatalities caused by an aerial attack on Britain during the entire war. The final Gotha raids took place in May 1918 by which time 22 attacks had been made and a total of 83 tons of bombs had been dropped on targets in the south-east of England.

230 G.IVs were built during 1916 and 1917, 30 examples by LVG were fitted with Hiero engines rather than Mercedes and modified to carry 8mm (0.315in) Schwarzlose machine-guns specifically for Austro-Hungarian service. All of the Gotha G.IVs to survive service during the First World War, which must have been a considerable number, was scrapped under the terms of the Treaty of Versailles.

GOTHA G.IV TECHNICAL INFORMATION

FIRST FLIGHT: 1916

ENGINE: Two 260hp Mercedes D.IVa

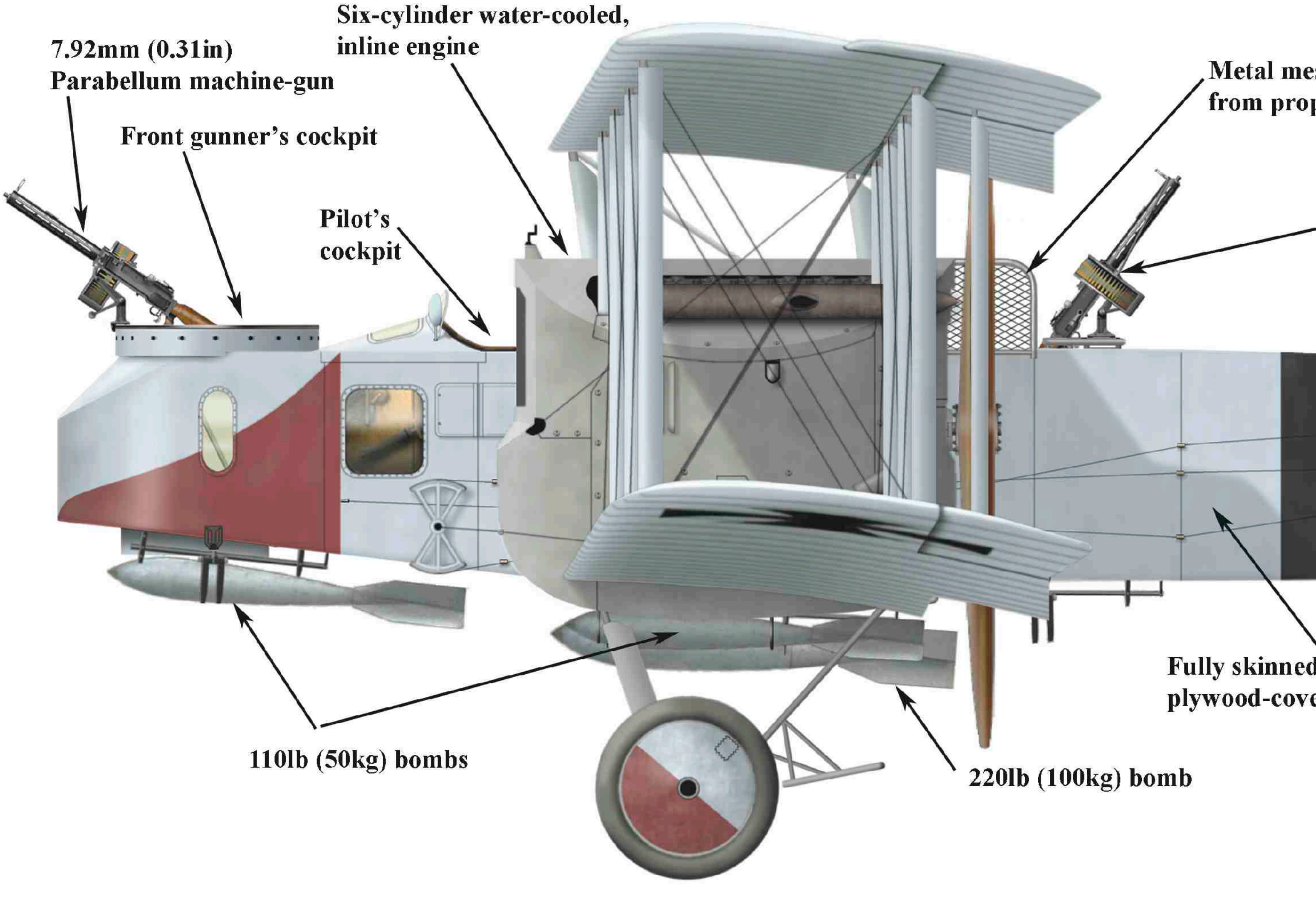
SPAN: 77ft 9in

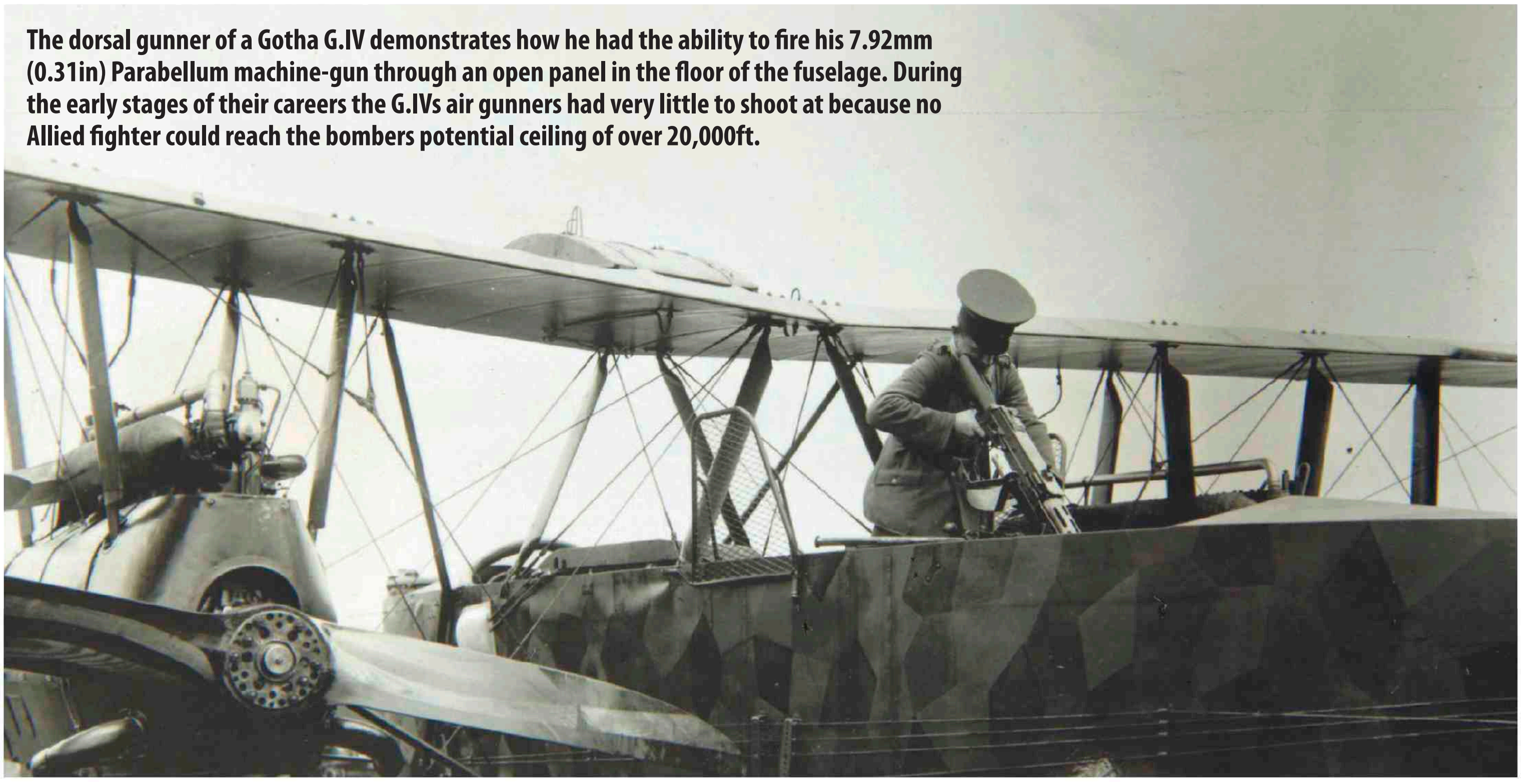
LENGTH: 38ft 11in

MAX SPEED: 87mph

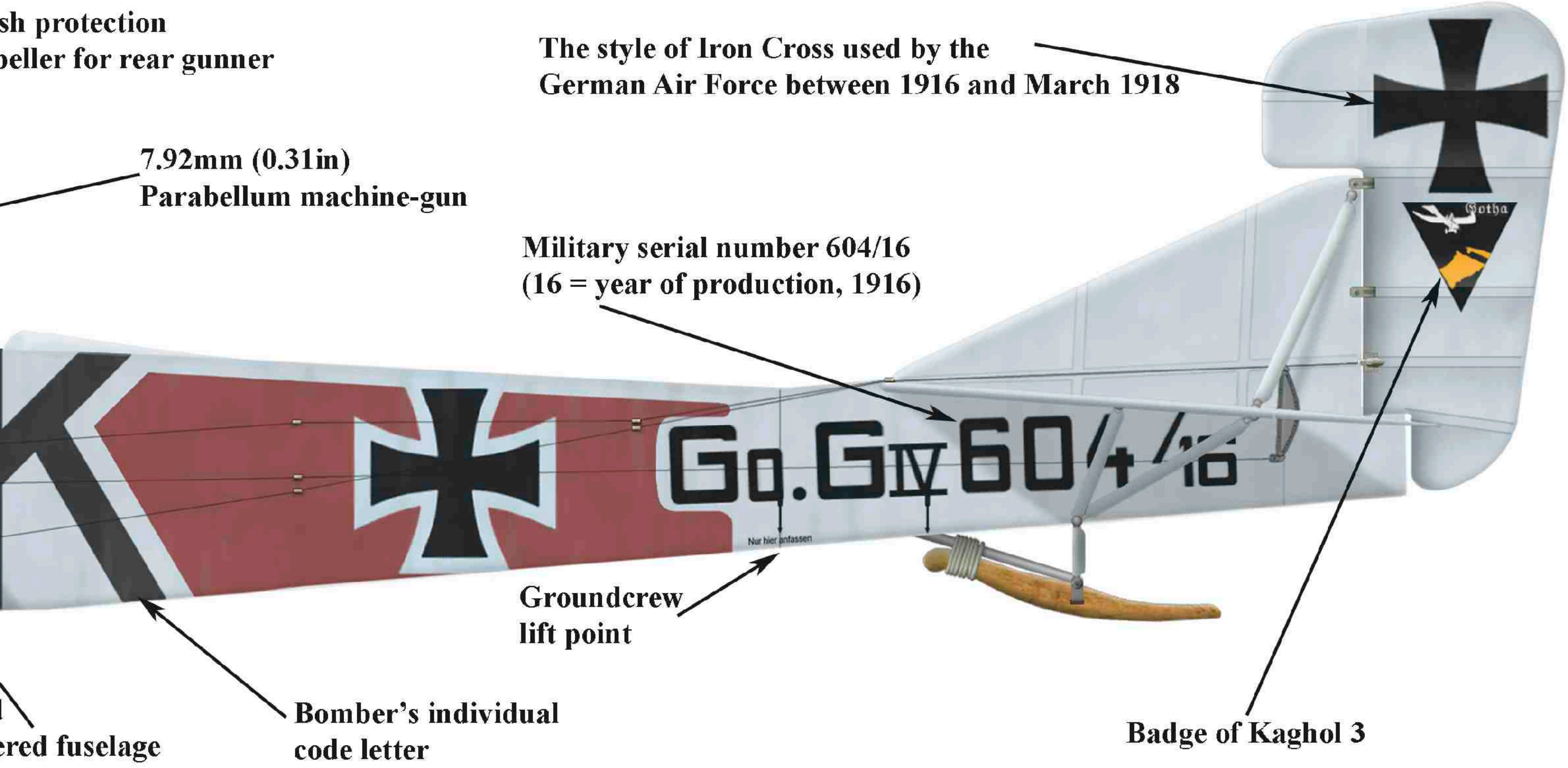
CREW: Three; pilot one air gunner and one air gunner/bomb aimer

ARMAMENT: Two 7.92mm (0.31in) Parabellum machine-guns on pivoted mounts in nose and dorsal positions and a bomb load of between 661lb and 1,102lb





The dorsal gunner of a Gotha G.IV demonstrates how he had the ability to fire his 7.92mm (0.31in) Parabellum machine-gun through an open panel in the floor of the fuselage. During the early stages of their careers the G.IVs air gunners had very little to shoot at because no Allied fighter could reach the bombers potential ceiling of over 20,000ft.


sh protection
peller for rear gunner
The style of Iron Cross used by the German Air Force between 1916 and March 1918
7.92mm (0.31in) Parabellum machine-gun
Military serial number 604/16 (16 = year of production, 1916)
Gotha
Go.G IV 604/16
Nur hier anfassen
Groundcrew lift point
l
ered fuselage
Bomber's individual code letter
Badge of Kaghol 3

Gotha G.IV 604/16 'K' of Kaghol 3 was flown by one of the section leaders which took part in the first raid on London on June 13, 1917 as part of Operation Türkenkreuz.

French Air Service premier fighter; the SPAD S.XIII

THE FIRST OF A SUCCESSFUL line of fighters for SPAD (Société Pour L'Aviation et ses Dérivés) began with the Louis Béchereau designed S.VII. The definitive SPAD design was the S.XIII which was developed directly from S.VII.

Bigger and heavier than the S.VII, the S.XIII had more power and twice the armament of its predecessor thanks to a pair of .303in Vickers machine-guns each supplied with 400 rounds. However it was not as manoeuvrable as the Sopwith Camel or the Fokker D.VII but could outpace both in a straight line and generally could out-dive most types thanks to the aircraft's strong construction.

The SPAD S.XIII joined the French Air Service from May 1917 onwards but deliveries were slow and by March 1918 just over a third of the planned 2,230 had been delivered. The United States Army Air Service embraced the type to such an extent that 15 of its 16 squadrons were equipped with the S.XIII by the end of the war, and many continued in service until 1920. The French retained the type even longer, not giving it up until 1923.

SPAD S.XIII TECHNICAL INFORMATION

FIRST FLIGHT: April 4, 1917

ENGINE: One 220hp Hispano-Suiza 8Be

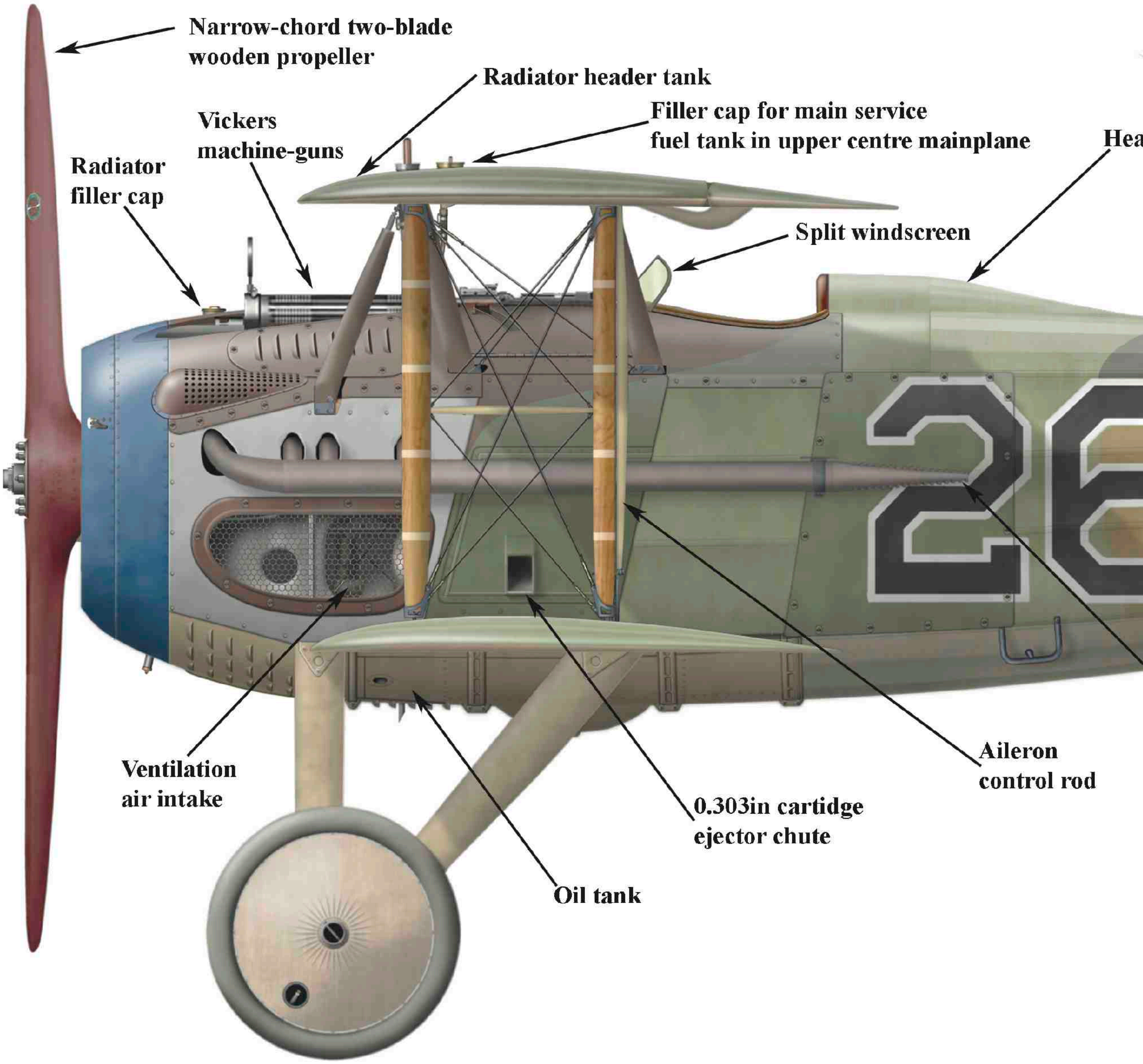
SPAN: 27ft 1in

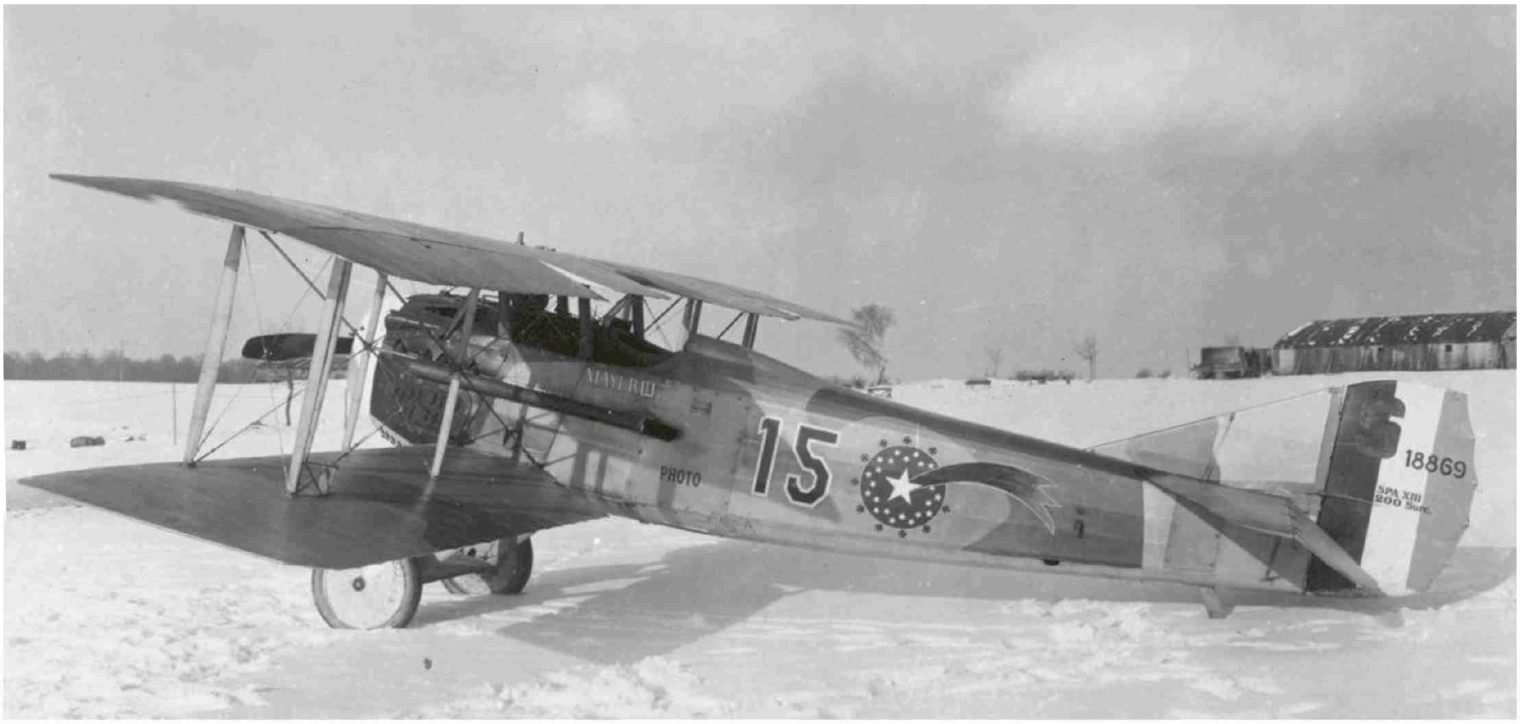
LENGTH: 20ft 6in

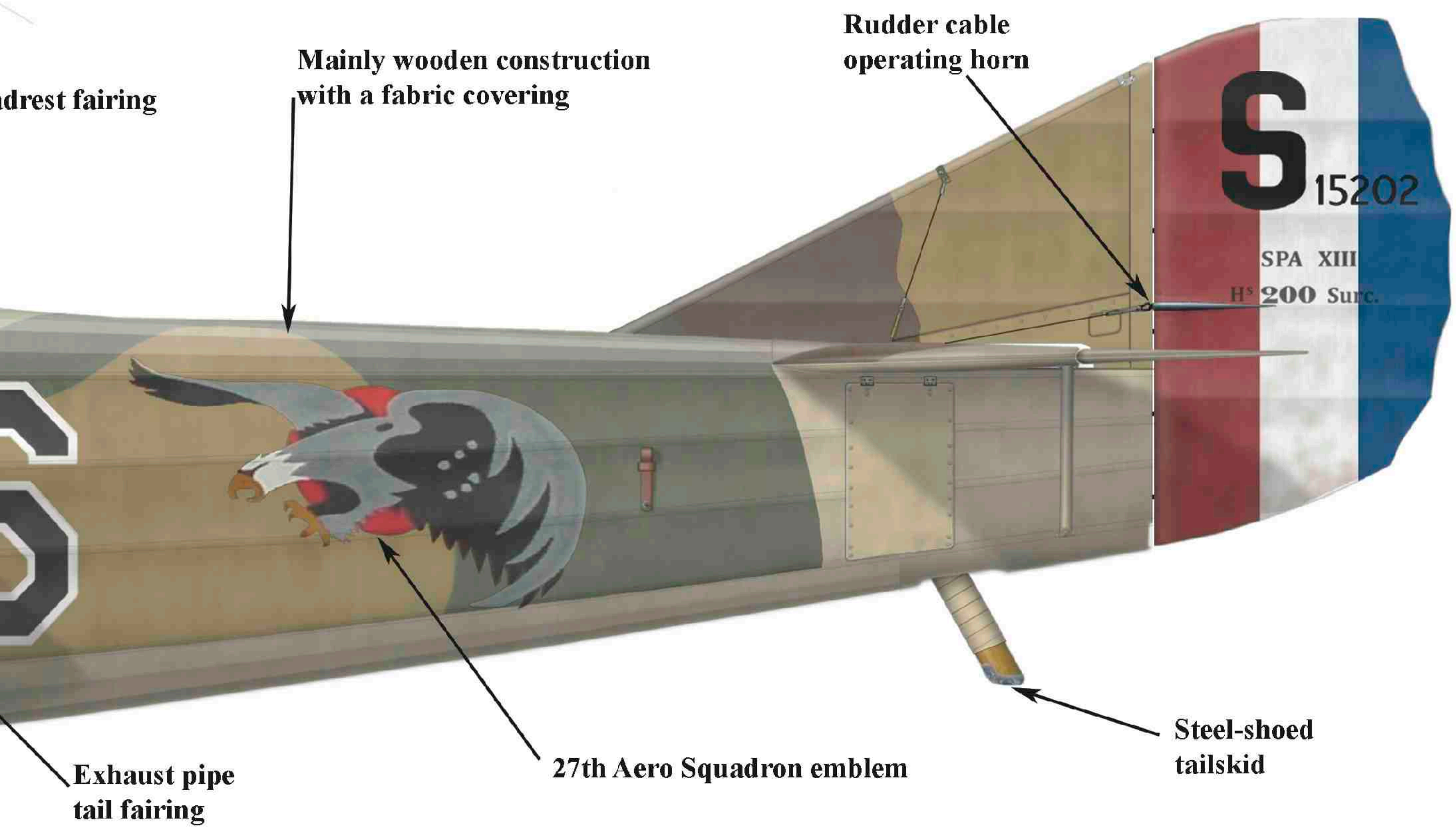
MAX SPEED: 135mph at 6,560ft

CREW: One

ARMAMENT: Two .303in (7.7mm) Vickers machine-guns


Narrow-chord two-blade wooden propeller
Radiator header tank
Filler cap for main service fuel tank in upper centre mainplane
Hea
Vickers machine-guns
Radiator filler cap
Split windscreen
26
Ventilation air intake
Aileron control rod
0.303in cartidge ejector chute
Oil tank

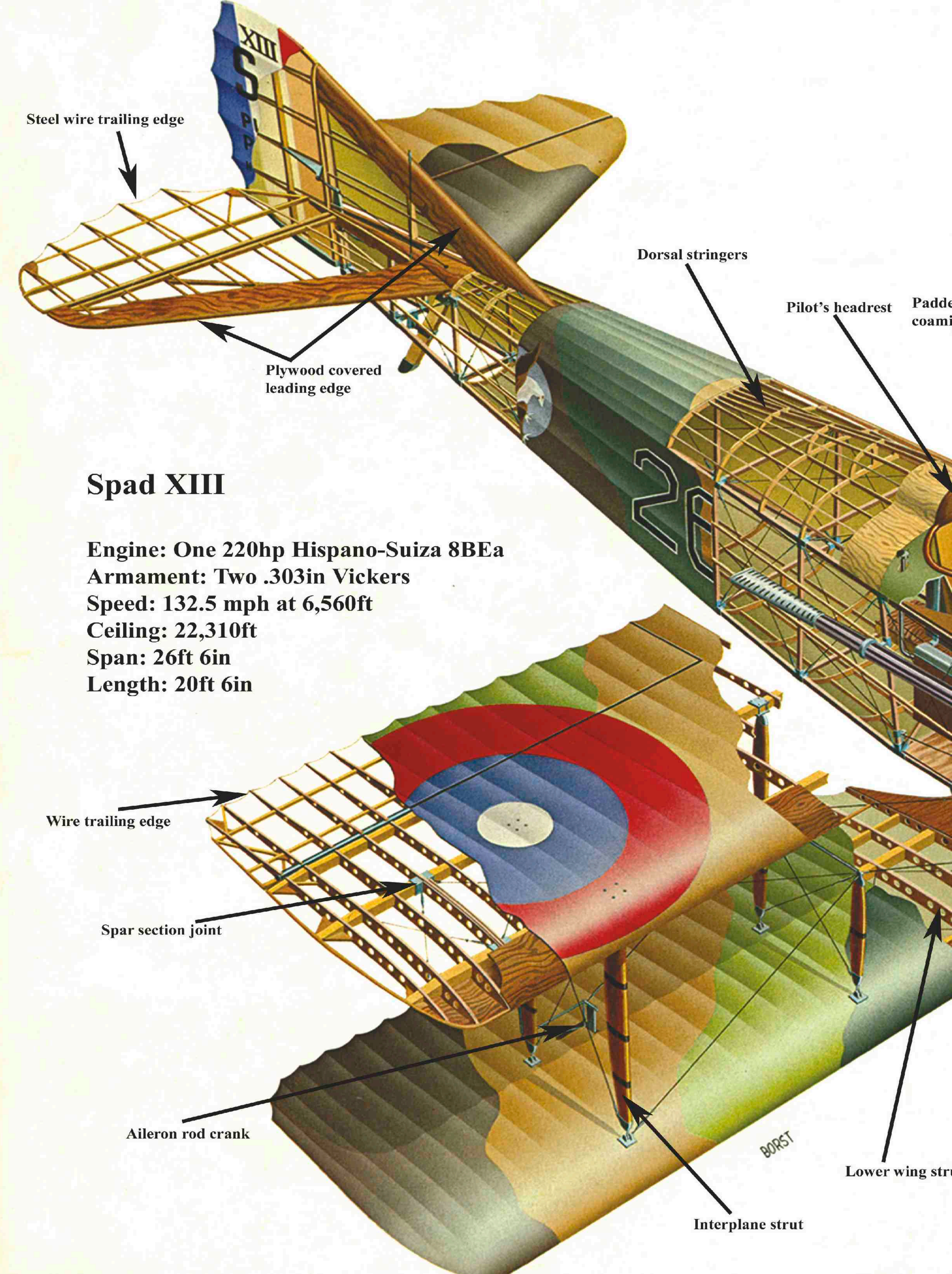


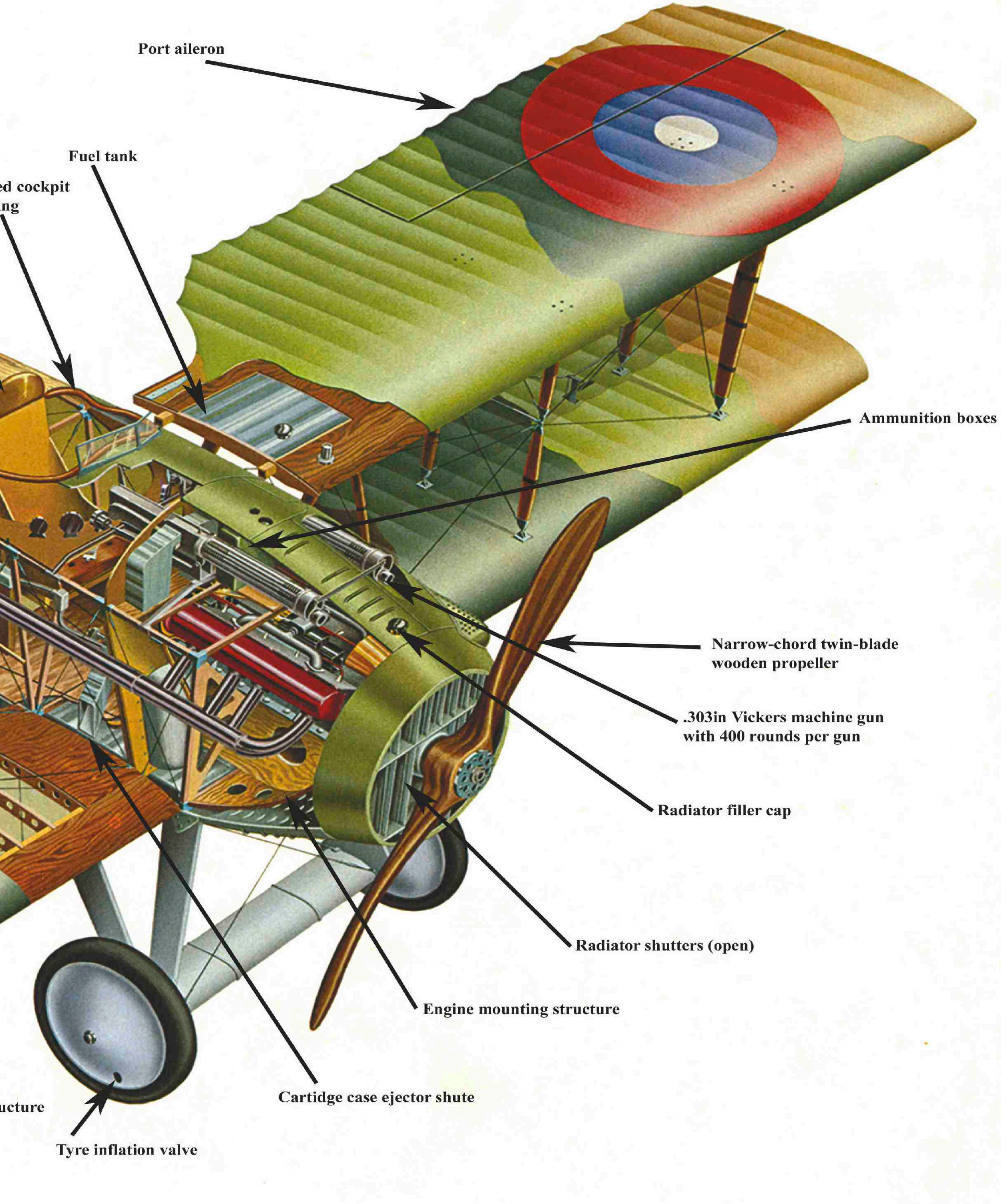

drest fairing
Mainly wooden construction with a fabric covering
Rudder cable operating horn
S 15202
SPA XIII
Hs 200 Surc.
Exhaust pipe tail fairing
27th Aero Squadron emblem
Steel-shoed tailskid

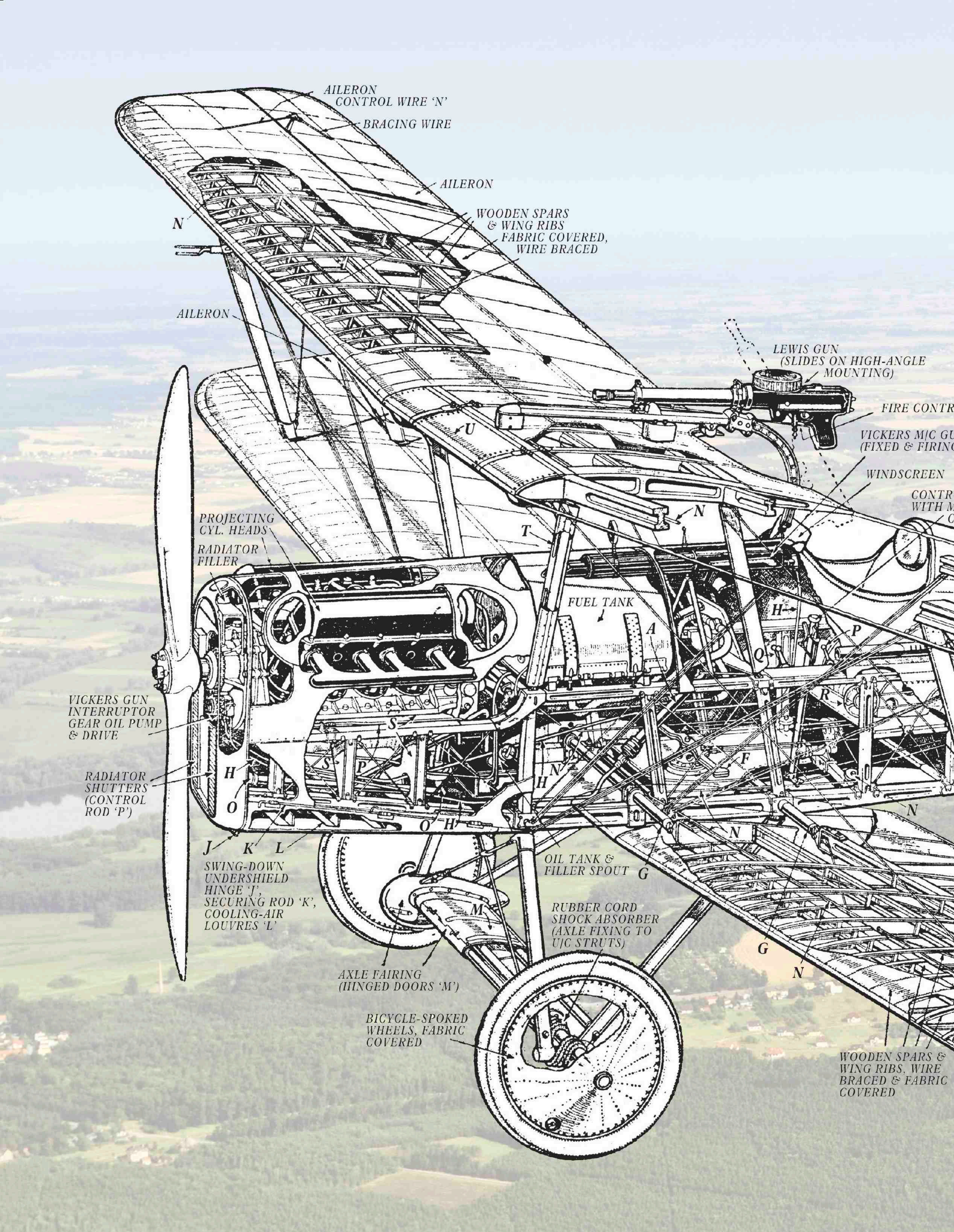
Above: SPAD S.XIII, S.15202 of the 27th Aero Squadron flown by 2nd Lt Frank Luke in September 1918. Nicknamed the 'Arizona Balloon Buster' Luke had 18 victories to his credit up to his death on September 29, 1918 at the tender age of 21. He was US Army Air Service's second highest scoring ace; only beaten by another SPAD specialist, Eddie Rickenbacker. Top: SPAD S.XIII, S.18869 as flown by Lt Jacques Michael Swaab of the 22nd Aero Squadron, 2nd Pursuit Group, United Sates Air Service in France, during the autumn of 1918. Swaab survived the war with ten victories to his credit.

Spad XIII

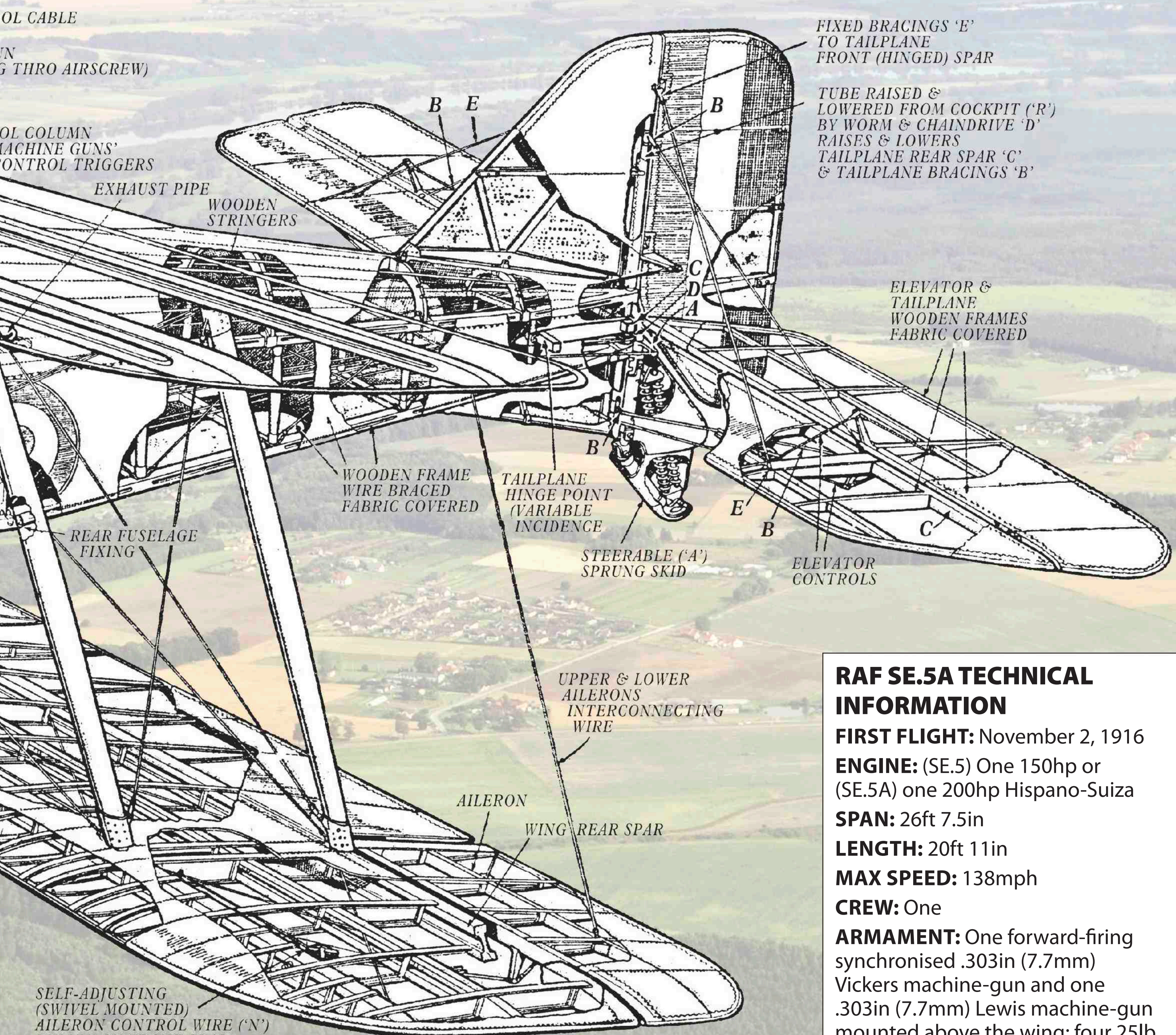
Engine: One 220hp Hispano-Suiza 8BEa
Armament: Two .303in Vickers
Speed: 132.5 mph at 6,560ft
Ceiling: 22,310ft
Span: 26ft 6in
Length: 20ft 6in




Port aileron
Fuel tank
ed cockpit
ng
Ammunition boxes
Narrow-chord twin-blade wooden propeller
.303in Vickers machine gun with 400 rounds per gun
Radiator filler cap
Radiator shutters (open)
Engine mounting structure
Cartidge case ejector shute
ucture
Tyre inflation valve


AILERON
CONTROL WIRE 'N'
BRACING WIRE
AILERON
N
WOODEN SPARS
& WING RIBS
FABRIC COVERED,
WIRE BRACED
AILERON
LEWIS GUN
(SLIDES ON HIGH-ANGLE
MOUNTING)
FIRE CONTR
U
VICKERS M/C GU
(FIXED & FIRING
WINDSCREEN
CONTR
WITH M
C
N
T
PROJECTING
CYL. HEADS
RADIATOR
FILLER
FUEL TANK
A
H
P
Q
R
VICKERS GUN
INTERRUPTOR
GEAR OIL PUMP
& DRIVE
S
S
P
F
RADIATOR
SHUTTERS
(CONTROL
ROD 'P')
H
O
N
H
O
H
N
N
J
K
L
SWING-DOWN
UNDERSHIELD
HINGE 'J',
SECURING ROD 'K',
COOLING-AIR
LOUVRES 'L'
OIL TANK &
FILLER SPOUT
G
M
RUBBER CORD
SHOCK ABSORBER
(AXLE FIXING TO
U/C STRUTS)
G
N
AXLE FAIRING
(HINGED DOORS 'M')
BICYCLE-SPOKED
WHEELS, FABRIC
COVERED
WOODEN SPARS &
WING RIBS, WIRE
BRACED & FABRIC
COVERED

The RAF SE.5a


OL CABLE
UN
G THRO AIRSCREW)
OL COLUMN
ACHINE GUNS'
ONTROL TRIGGERS
EXHAUST PIPE
WOODEN STRINGERS
B
E
FIXED BRACINGS 'E' TO TAILPLANE FRONT (HINGED) SPAR
B
TUBE RAISED & LOWERED FROM COCKPIT ('R') BY WORM & CHAINDRIVE 'D' RAISES & LOWERS TAILPLANE REAR SPAR 'C' & TAILPLANE BRACINGS 'B'
C
D
A
ELEVATOR & TAILPLANE WOODEN FRAMES FABRIC COVERED
B
WOODEN FRAME WIRE BRACED FABRIC COVERED
TAILPLANE HINGE POINT (VARIABLE INCIDENCE
E
B
C
REAR FUSELAGE FIXING
STEERABLE ('A') SPRUNG SKID
ELEVATOR CONTROLS
UPPER & LOWER AILERONS INTERCONNECTING WIRE
AILERON
WING REAR SPAR
SELF-ADJUSTING (SWIVEL MOUNTED) AILERON CONTROL WIRE ('N') PULLEY ON FRONT SPAR

RAF SE.5A TECHNICAL INFORMATION

FIRST FLIGHT: November 2, 1916

ENGINE: (SE.5) One 150hp or (SE.5A) one 200hp Hispano-Suiza

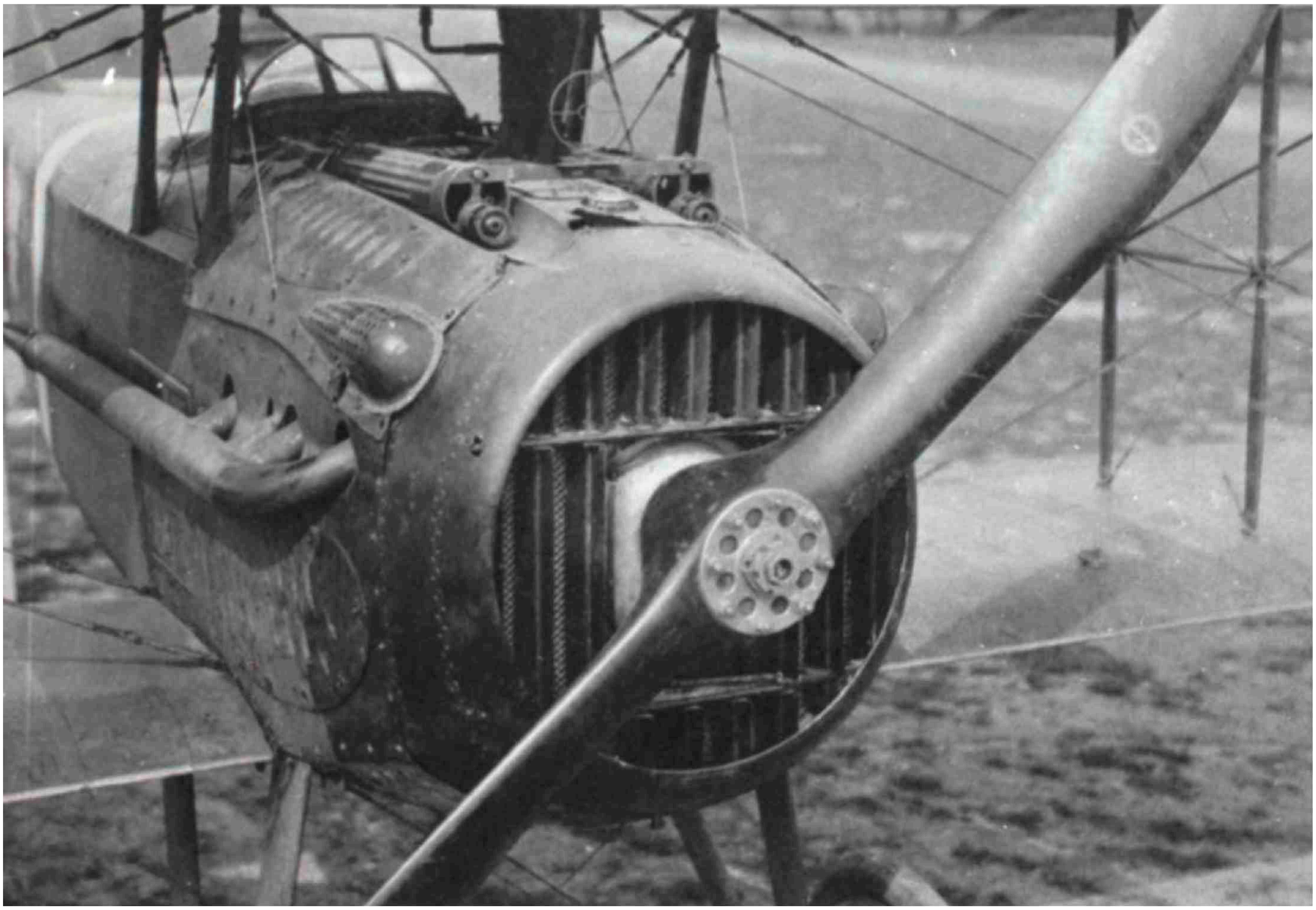
SPAN: 26ft 7.5in

LENGTH: 20ft 11in

MAX SPEED: 138mph

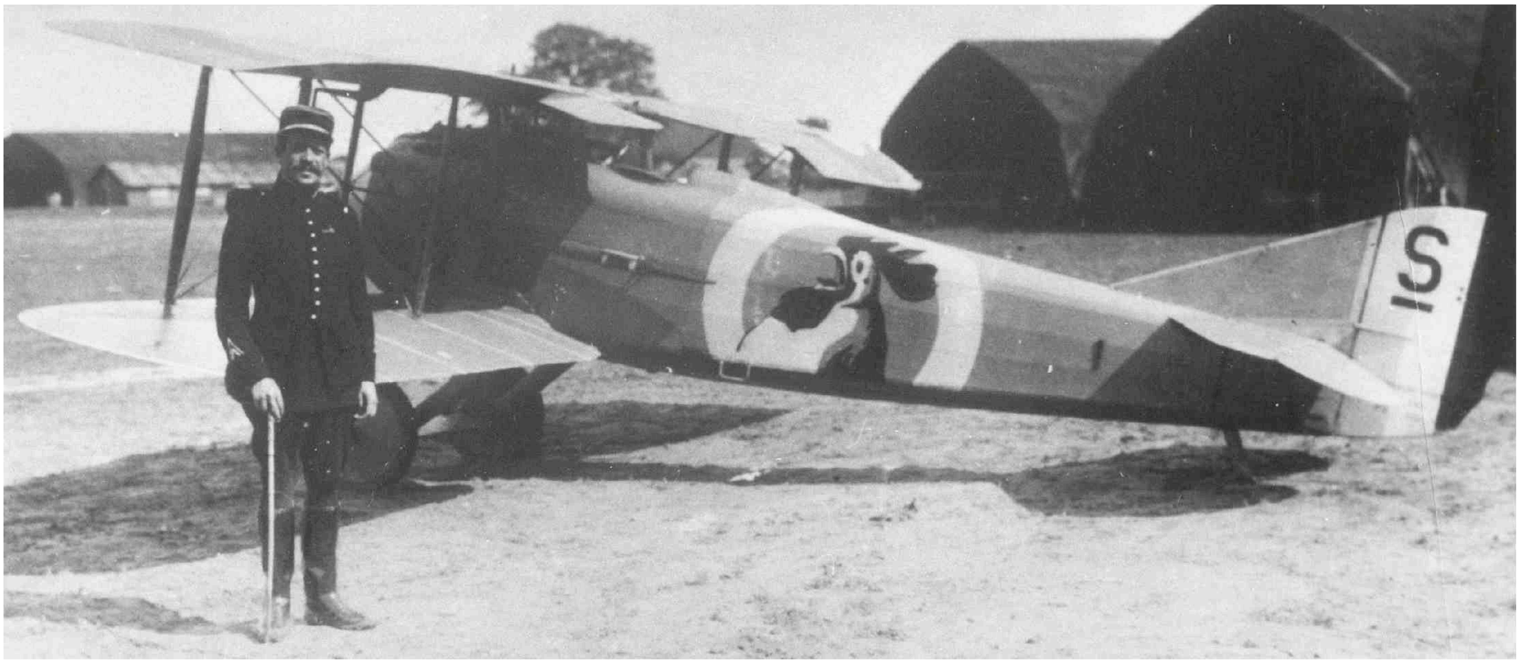
CREW: One

ARMAMENT: One forward-firing synchronised .303in (7.7mm) Vickers machine-gun and one .303in (7.7mm) Lewis machine-gun mounted above the wing; four 25lb bombs under the wings



▲ View of a SPAD S.XIII's grilled radiator shutters which could be opened or closed to control cooling. Note the aircraft's twin synchronised .303in Vickers machine-guns which were supplied with 400 rounds per gun; just under one minute's supply if fired continuously.

▼ Capitaine Armand Jean Galliot Joseph de Turenne poses in front of his SPAD S.XIII C1 'S' of Escadrille Spa 48. Born in Le Mans in 1891, the Marquis de Turenne joined the French cavalry before the war but transferred to the French Aviation Militaire not long after it began. De Turenne joined Esc 48 in June 1916 and scored his first of 15 aerial victories in November.

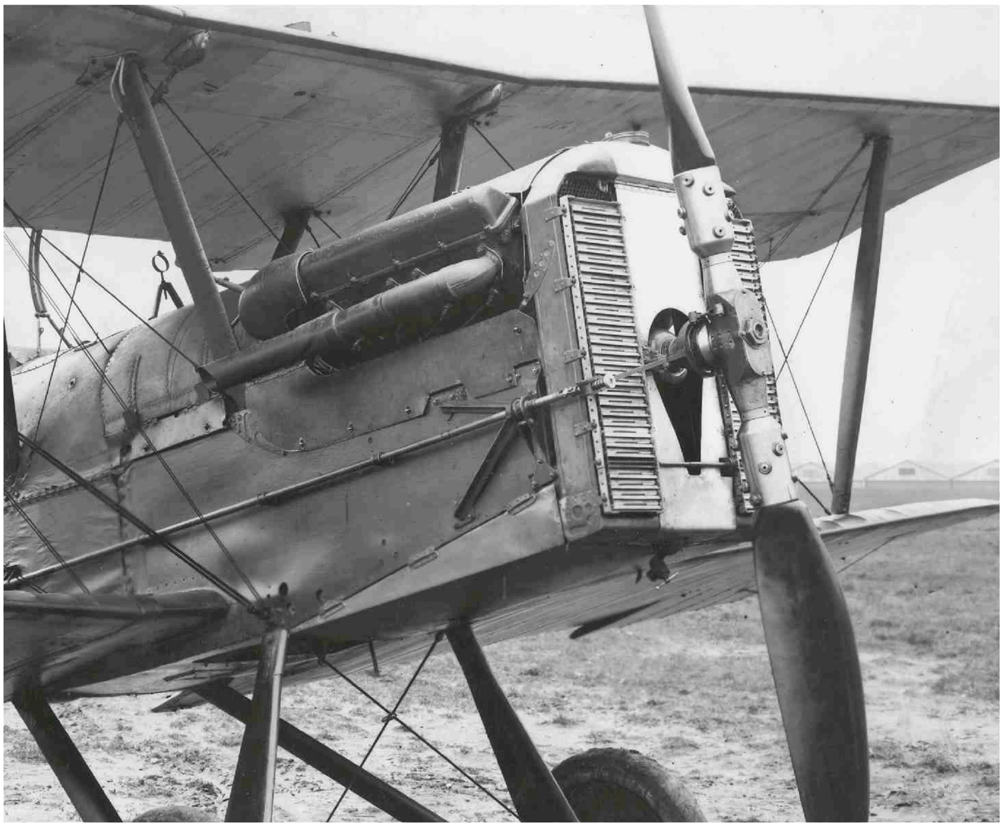


Farnborough's outstanding 'Scout Experimental'; the RAF SE.5a

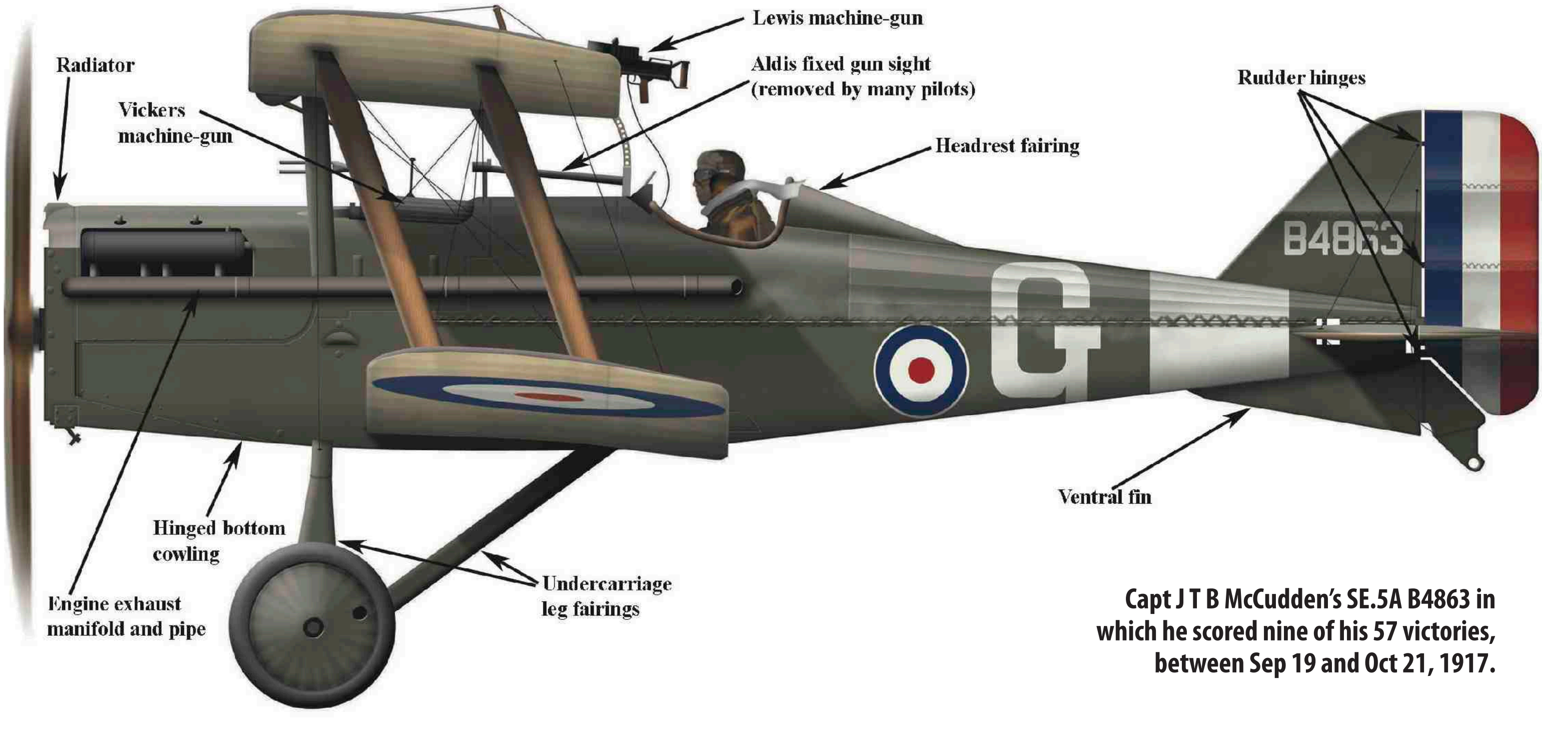
THE SE.5 AND SE.5a were by far the most successful aircraft to be built by the Royal Aircraft Factory during its short existence. Designed by a team headed by Henry P Folland the aircraft was single-seat equal-span biplane powered by a static inline water-cooled engine, rather than a torque inducing rotary engine. This made the SE.5 easy to fly which was a factor in the initial design compared to the rotary machines which only really shone in experienced hands. The down side was that the SE.5 was less manoeuvrable than the Camel.

The original SE.5 was powered by 150hp Hispano-Suiza Vee engine which was a newly developed powerplant that had its share of early teething problems. These problems were carried into the type's early service career which began with the RFC over France from April 1917. Still under development, the Hispano-Suiza produced a 200hp version which was subsequently fitted into the SE.5a that entered service from June onwards and systematically replaced the SE.5 with frontline squadrons.

During its early service the SE.5a suffered with a range of problems which mainly centred around the inadequately developed engine and the fighter's Constantinesco interrupter gear for the fixed forward-firing Vickers machine-gun. Once these problems were ironed out, the SE.5a quickly evolved into one of the most formidable Allied fighters and, along with Camel, made sure that aerial superiority remained.

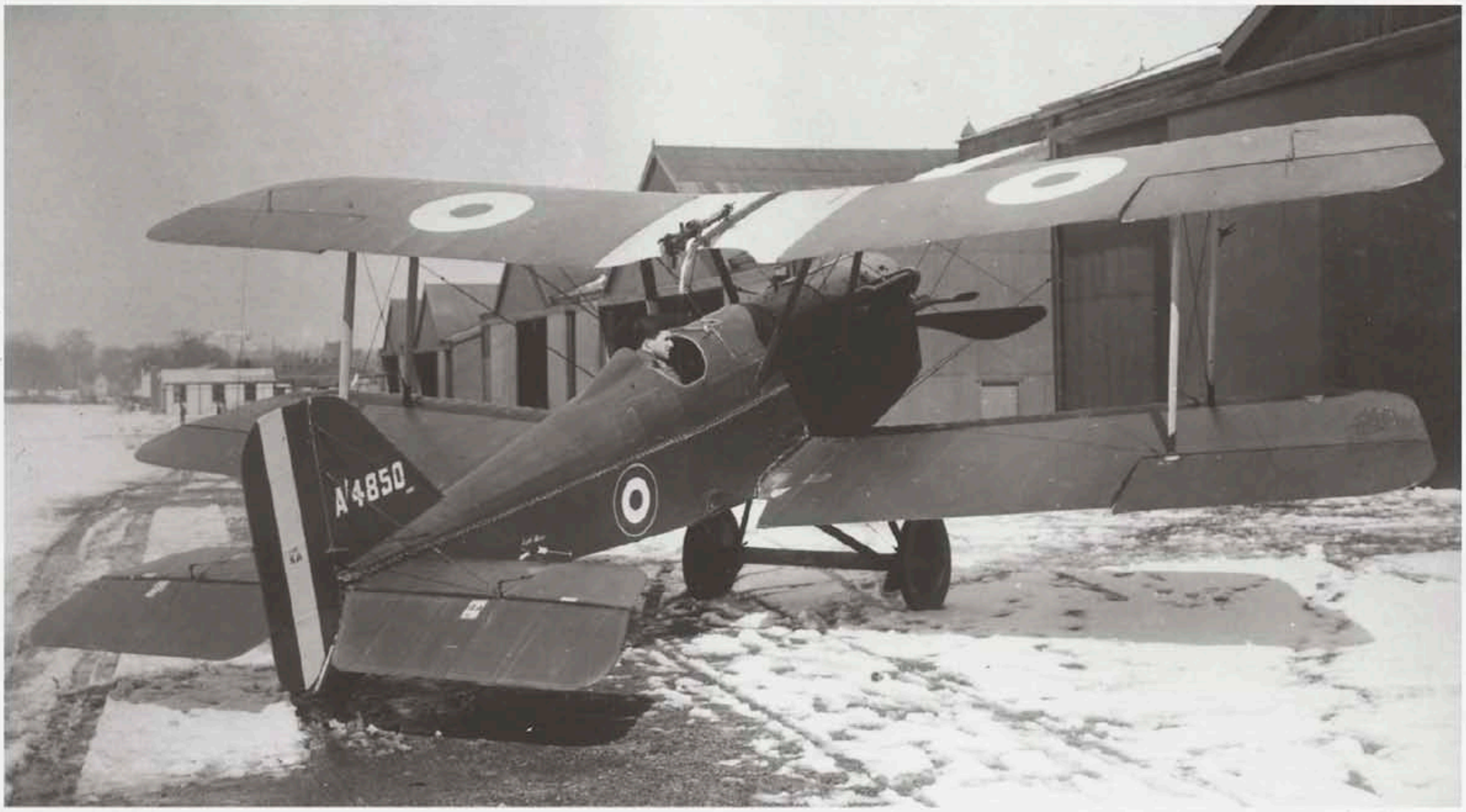


5,205 RAF SE.5 and SE.5a were built, including a small number of two-seater variants. The fighter not only served in France but also Egypt, Mesopotamia, Palestine and Salonika and a large number were also allocated to Home Defence squadrons in Britain. The type was not ideally suited to the interceptor role because of the time it took for the Hispano-Suiza engine to reach working temperature.



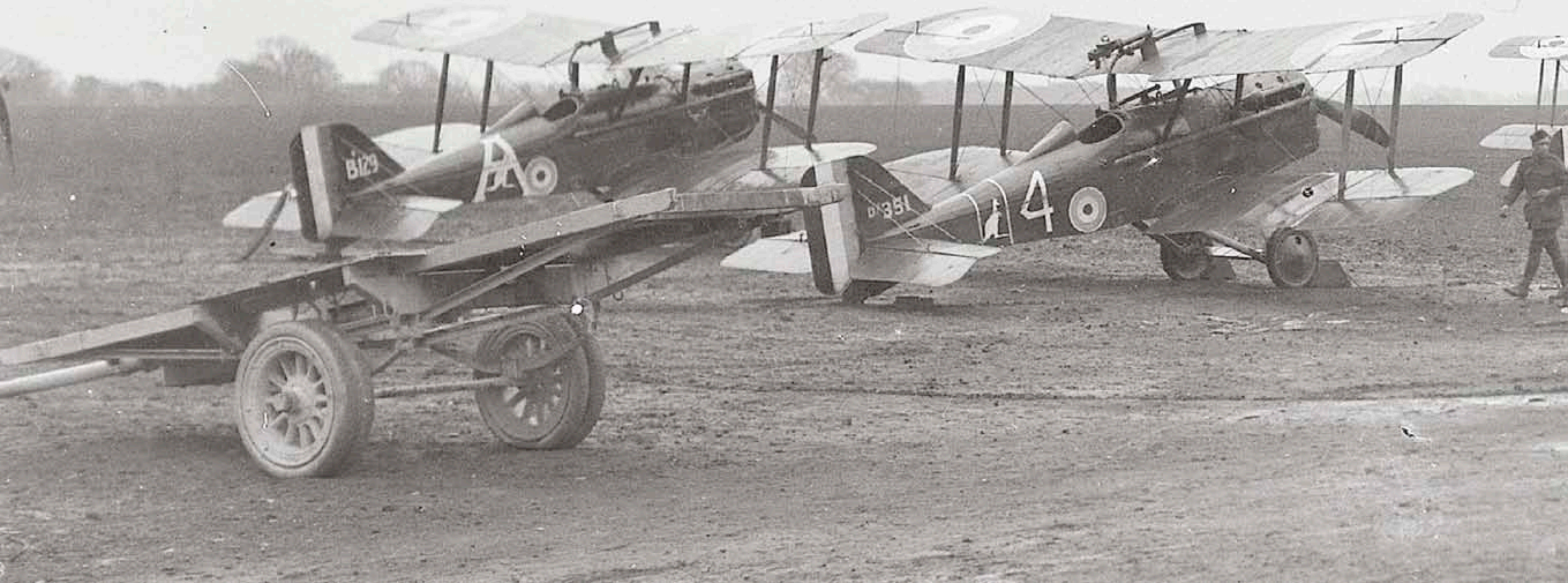
Capt J T B McCudden's SE.5A B4863 in which he scored nine of his 57 victories, between Sep 19 and Oct 21, 1917.

Profile credit: Andy Hay/www.flyingart.co.uk



The SE.5 was the mount of several great aces of the First World War including Albert Ball who is pictured at London Colney in July 1916 in a 56 Squadron SE.5. With a total of 44 victories to his credit, Ball was killed on May 7, 1917.

A line of Australian Air Corps SE.5a's including B127, D351 and F9075 of 6 Squadron during their service as part of the 1st Training Wing at Minchinhampton in Gloucestershire. Note the Avro 504Ks in view as well in this image that was probably taken in early 1919; the unit was disbanded in March of that year.



Formed at Upavon from 'C' Flight, CFS on August 1, 1917, 85 Squadron was re-equipped with the SE.5a at Hounslow in May 1918 under the command of Mjr William Avery Bishop VC, DSO, MC. Bishop went on to become the highest Allied ace of the First World War.

Nimble and harmonised; the Hanriot HD.1

FOUNDED BY RENÉ HANRIOT in 1907, the Aeroplanes Hanriot et Cie, also simply known as the Hanriot Company, based at Neuilly-Sur-Seine, Paris produced a diverse range of aircraft before the outbreak of the First World War. Once the conflict began, Hanriot settled into a period of sub-contract work including producing a large number of Sopwith 1½ Strutters before embarking on their first single-seat fighter design.

Designed by Emile Dupont, the Hanriot HD.1 shared a large number of features with the two-seat Strutter including the mainplanes. A very compact and purposeful looking aircraft, the HD.1 flew as well as it looked; despite only being powered by an 110hp Le Rhône, the lack of performance was counteracted by superb manoeuvrability. This lack of power meant that the HD.1s main rival at the time, the SPAD S.VII was ordered in large numbers by the French Aviation Militaire instead but this excellent little fighter was not overlooked by the Belgians or the Italians, who were both in need of new fighters to equip their air arms.

Italy was so impressed with the HD.1, 100 aircraft were ordered and from November 1916 the Italian aircraft manufacturer Macchi, licenced-built a further 901, 70 of them after the war had ended. The Belgians were supplied with 125 French-built HD.1s from August 1917 and like Italy, flew the type for the remainder of the war; Italy retained the HD.1 until 1925 and Belgium until 1928 in operational service.

HANRIOT HD.1 TECHNICAL INFORMATION

FIRST FLIGHT: June, 1916

ENGINE: One 120hp Le Rhône 9jb

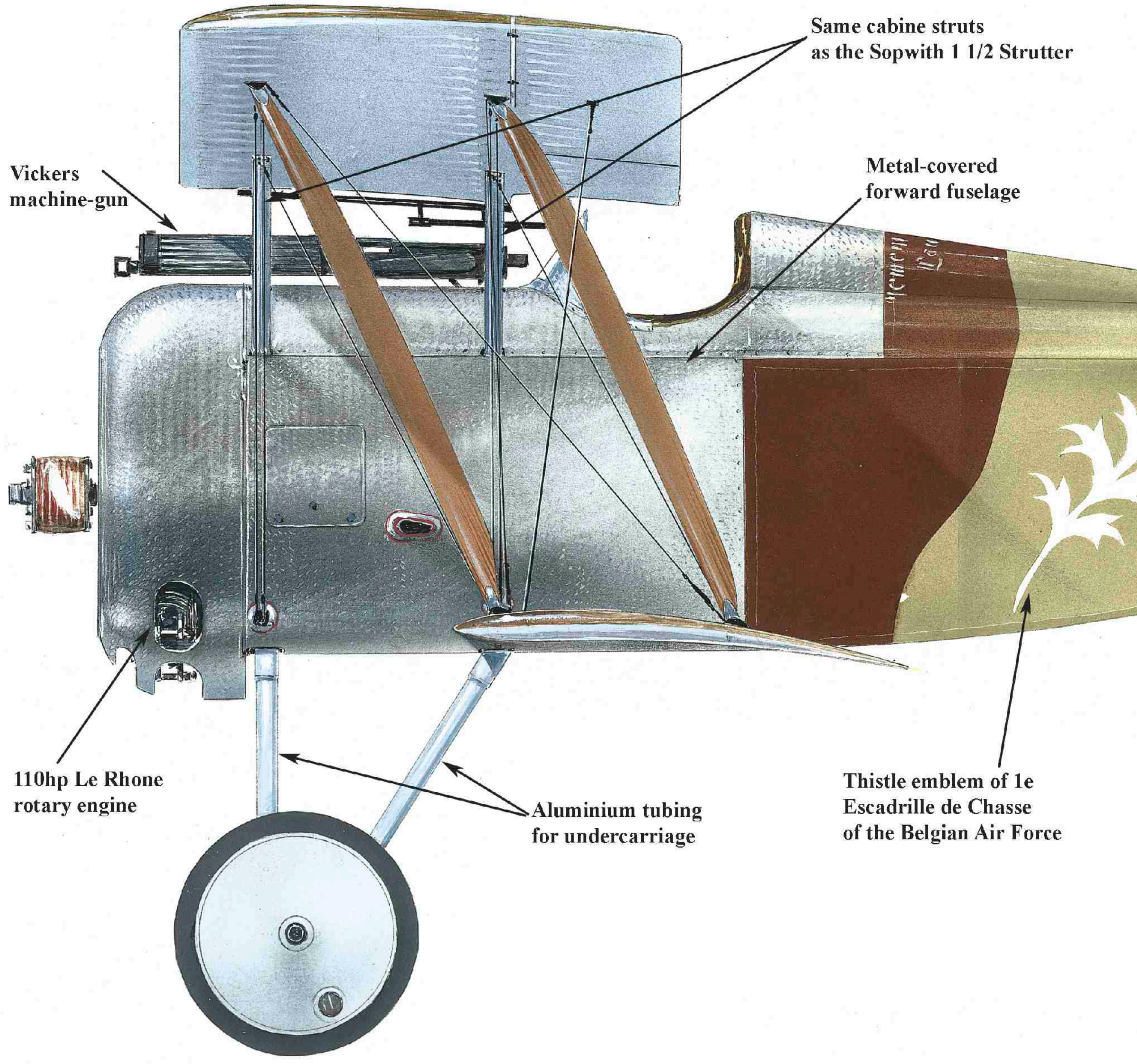
SPAN: 28ft 6.5in

LENGTH: 19ft 2.25in

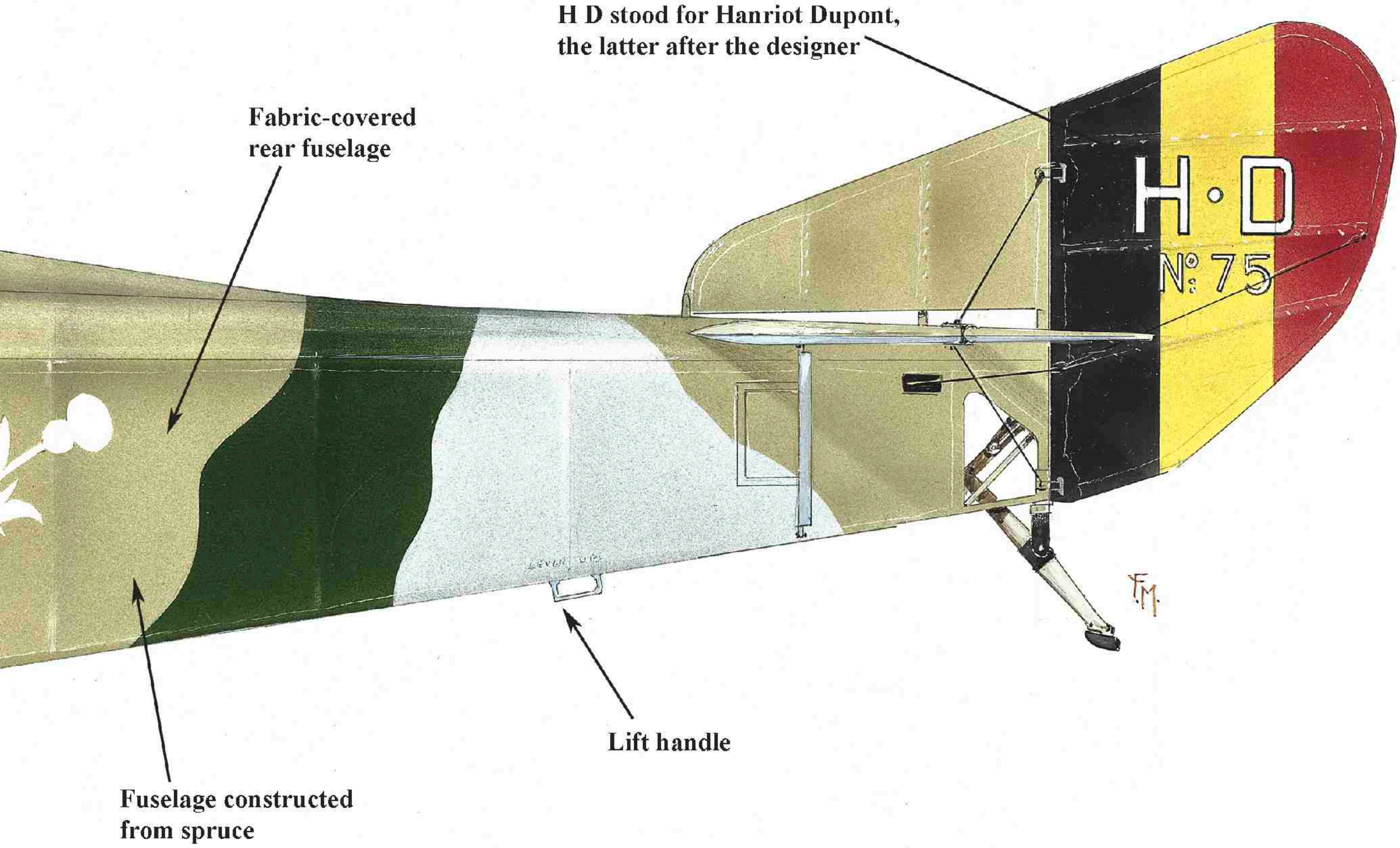
MAX SPEED: 114mph

CREW: One

ARMAMENT: One fixed forward-firing synchronised .303in (7.7mm) Vickers machine-gun


Same cabine struts as the Sopwith 1 1/2 Strutter
Vickers machine-gun
Metal-covered forward fuselage
110hp Le Rhone rotary engine
Aluminium tubing for undercarriage
Thistle emblem of 1e Escadrille de Chasse of the Belgian Air Force

The Italian aircraft manufacturer Macchi built more HD.1s than Hanriot themselves with 901 built. The HD.1 became the standard Italian fighter by the end of the First World War, operating the aircraft against the Austrians and also in Macedonia and Albania. Six operational Regia Aeronautica squadriglie de caccia were still flying the HD.1 in 1925.



H D stood for Hanriot Dupont, the latter after the designer

Fabric-covered rear fuselage

Lift handle

Fuselage constructed from spruce

HD.1, No.75 was built by Hanriot in September 1918 and was first delivered to 1e Escadrille de Chasse ('Thistle' Squadron), Aviation Belge as HD-75. The aircraft remained in Belgian Air Force service until 1928 and was not fully withdrawn until the early 1930s. Spotted by Richard Shuttleworth while he was holidaying in Belgium, the famous collector bought the aircraft in November 1937 and flew the Hanriot from Évère, Brussels to Old Warden. Sold in 1962 to Marvin Kingham Hand, it was later presented to the RAF Museum in 1978 and is currently on display in the Graham White Factory building.

The formidable Fokker; the D.VII

DESIGNED BY REINHOLD PLATZ in response to Germany's first single-seat fighter competition in 1918, the latest Fokker was initially designated as the V11. A great deal of the design was drawn from the successful Dr.I, the fuselage in particular had a similar profile and was constructed in the same way. The V11 obviously performed well because in January 1918, the aircraft was ordered into production as the Fokker D.VII. The new fighter was a much better performer than the Albatros D.V and to add insult to injury the Albatros Werke GmbH was ordered to build the Fokker D.VII at both of its factories.

By May 1918 the D.VII was already in service with Jasta 10 and during early encounters with Allied aircraft, the Fokker was only matched by the Sopwith Snipe and the SPAD S.XIII. Highly manoeuvrable the Fokker D.VII was structurally much stronger than all previous German fighters, giving a new confidence to pilots lucky enough to fly the type in combat during the closing months of the war.

By the Armistice over 700 D.VIIs had been delivered and the aircraft had had such an effect the fighter and all Zeppelin airships were the only enemy machines to be specifically singled out by the Peace Treaty for total confiscation by the victorious Allies.

FOKKER D.VII TECHNICAL INFORMATION

FIRST FLIGHT: January 1918

ENGINE: One 185hp BMW III

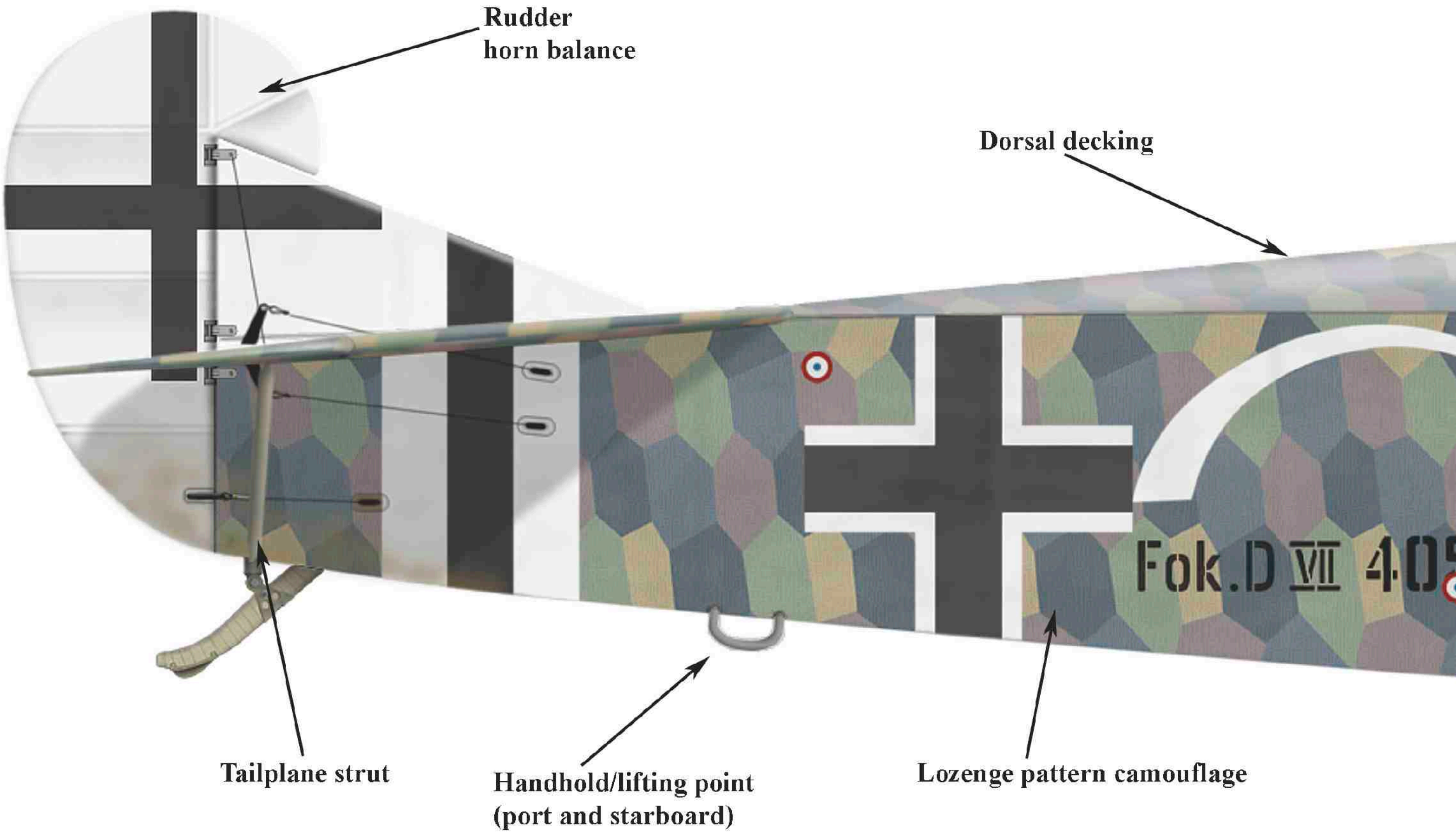
SPAN: 29ft 2.5in

LENGTH: 22ft 9.5in

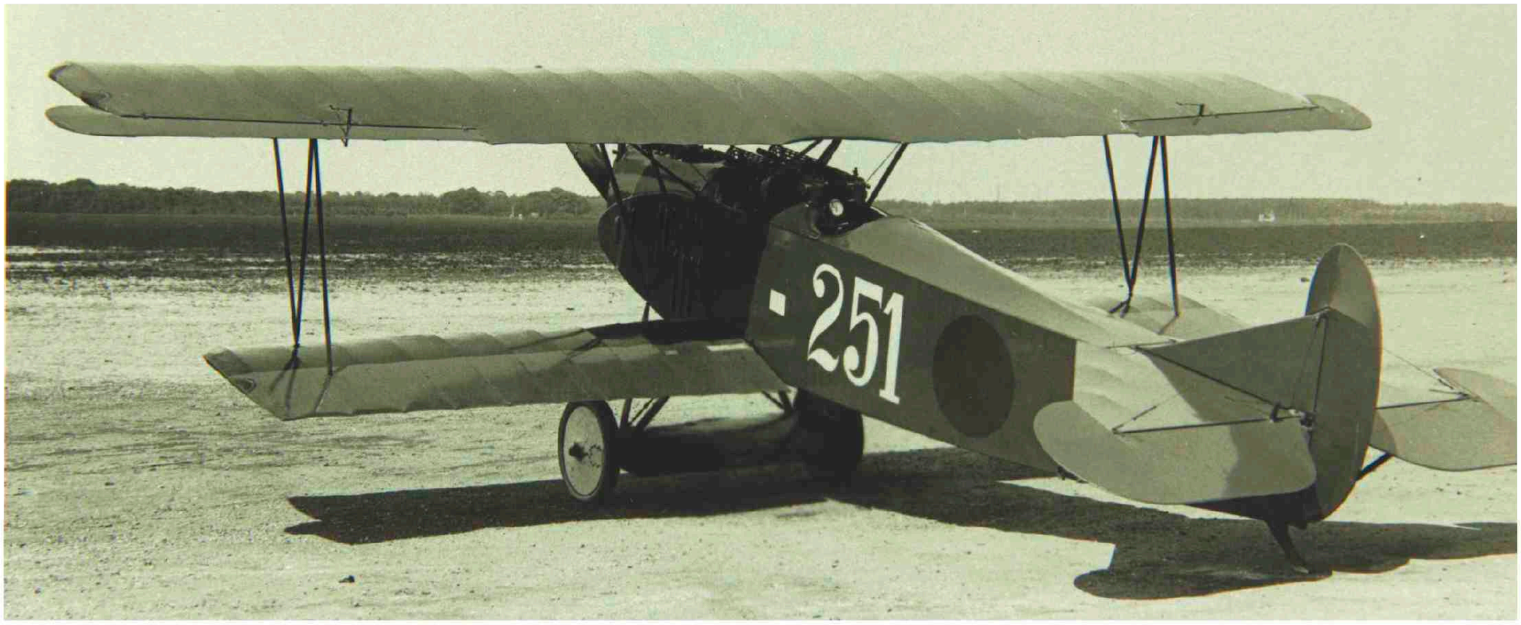
MAX SPEED: 124mph at 3,280ft

CREW: One

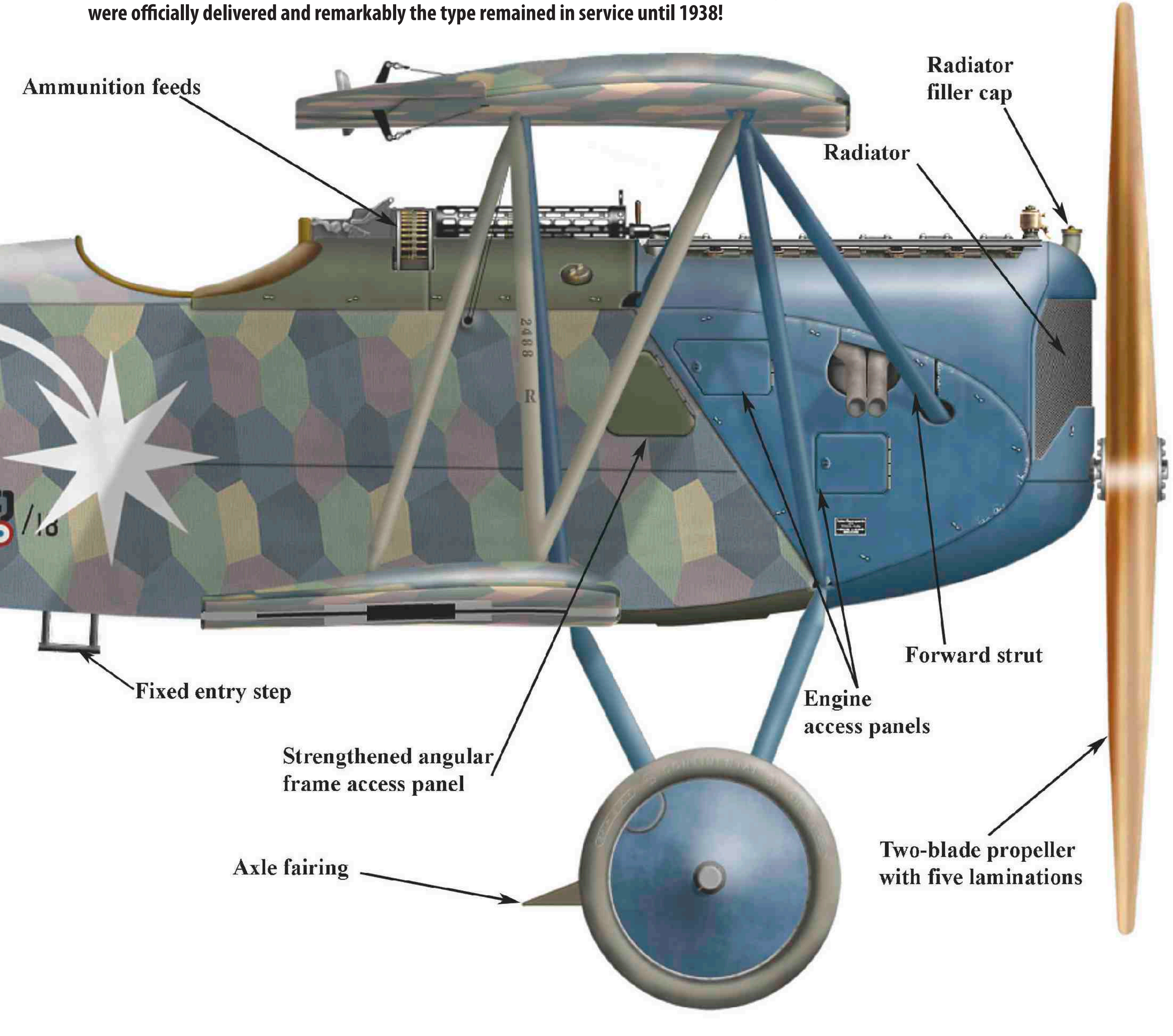
ARMAMENT: Two fixed forward-firing synchronised 7.92mm (0.31in) LMG 08/15 machine-guns

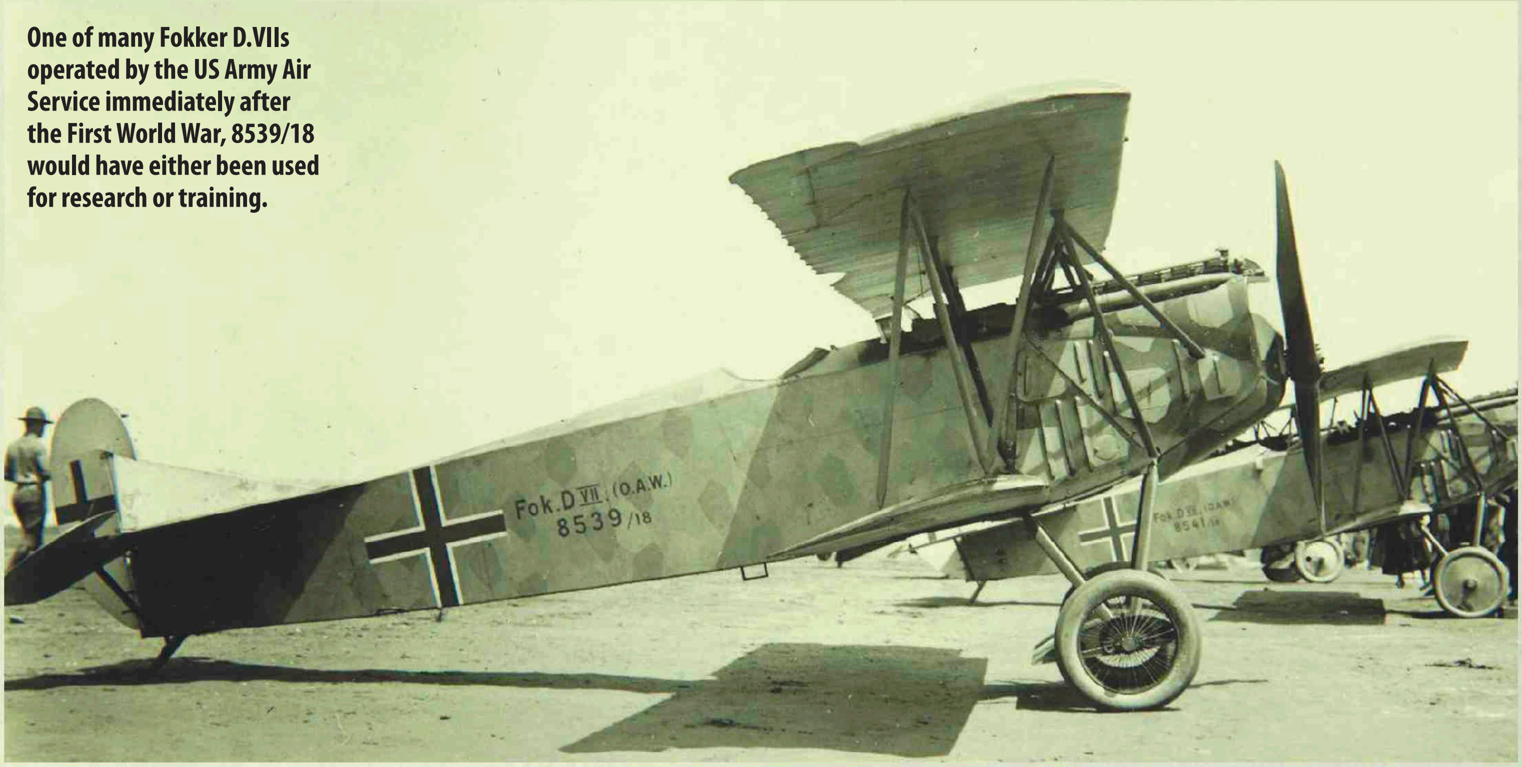

Rudder horn balance
Dorsal decking
Fok.D VII 40
Tailplane strut
Handhold/lifting point (port and starboard)
Lozenge pattern camouflage

▲ Fokker D.VII 402/18 as flown by Vizefeldwebel Max Holtzem of Jasta 16b during mid-1918. The comet insignia on the side of the fuselage is in memory of his mother who passed away when Holtzem was just nine years old; the aircraft was nicknamed his 'Guardian Angel'. She obviously looked after both man and machine as both survived the war; in fact Holtzem lived to the ripe old age of 88 and died in 1980.

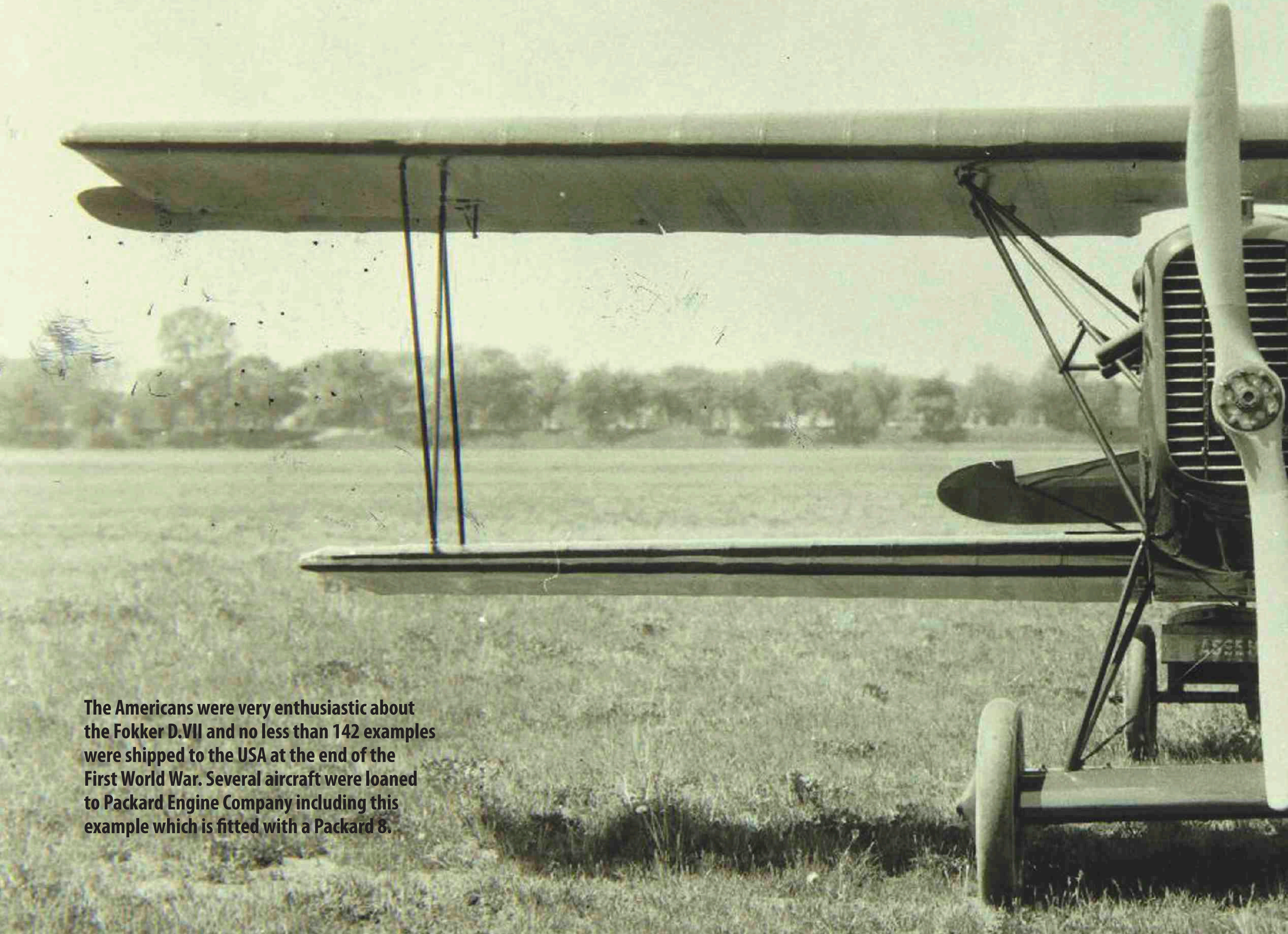


▲ **The Fokker D.VII served with the LVA (Luchtvaartafdeling) from late 1918 when a single example was interned and pressed into service. Following the Armistice five landed near Stein but were not used by the LVA but from 1920 a batch were officially delivered and remarkably the type remained in service until 1938!**

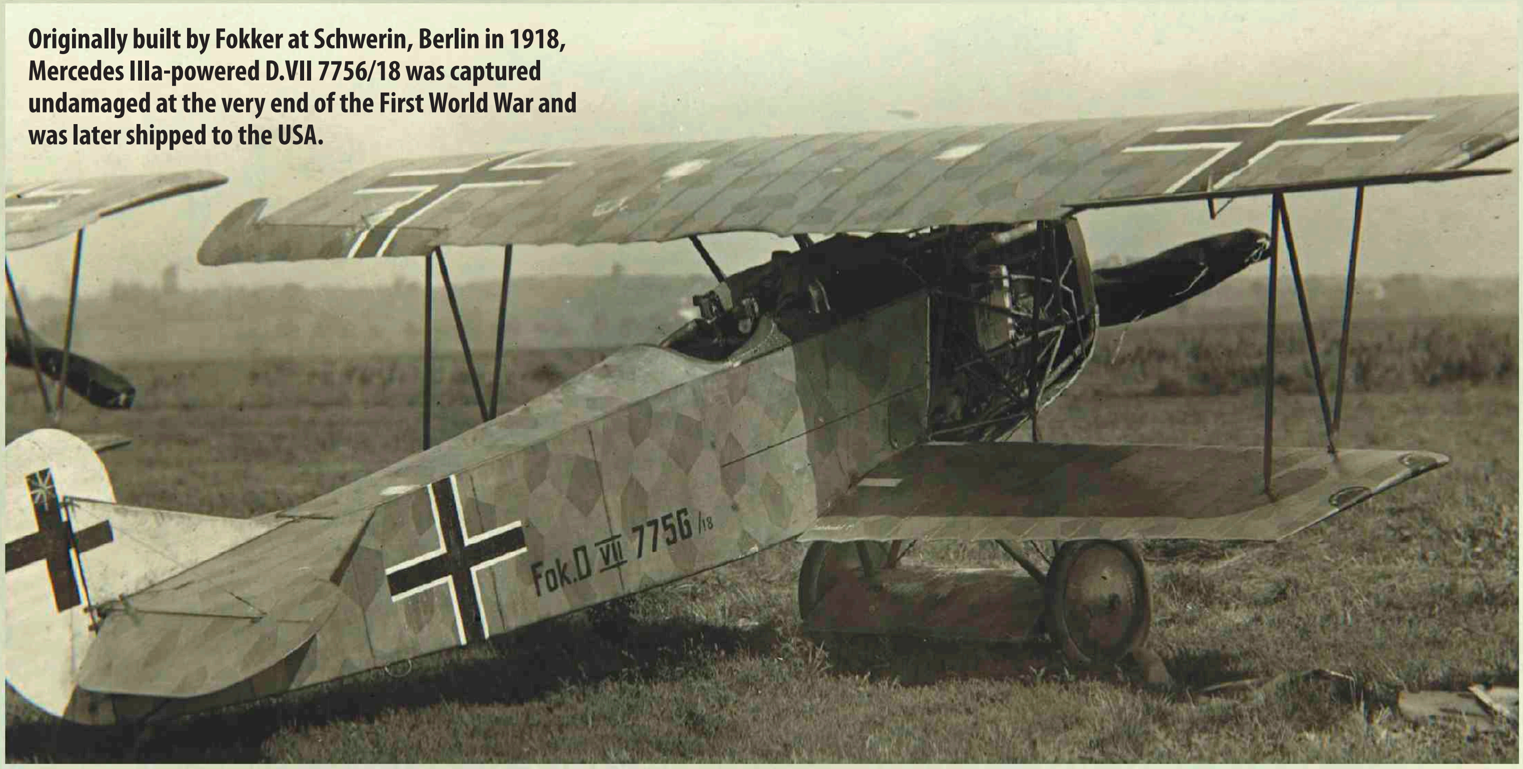




One of many Fokker D.VIIs operated by the US Army Air Service immediately after the First World War, 8539/18 would have either been used for research or training.



The Americans were very enthusiastic about the Fokker D.VII and no less than 142 examples were shipped to the USA at the end of the First World War. Several aircraft were loaned to Packard Engine Company including this example which is fitted with a Packard 8.



Originally built by Fokker at Schwerin, Berlin in 1918, Mercedes IIIa-powered D.VII 7756/18 was captured undamaged at the very end of the First World War and was later shipped to the USA.

The fastest Allied aircraft of the First World War; the Ansaldo S.V.A.5 Primo

WORK BEGAN ON A NEW Italian fighter biplane in the hands of engineers U Savoia and R Verduzion ably assisted by Celestino Rosatelli in the spring of 1916. By the autumn the project, powered by a 200hp S.P.A. GA engine, was given the support of the Italian Ministry of War, who requested that the shipbuilding company Giovanni Ansaldo & Co. of Genoa build prototypes and acquire factory space for potential massed production. On March 19, 1917 the prototype had already taken to the air from Grosseto aerodrome.

All S.V.A. designs featured the same diagonal wing bracing struts and a triangular section rear fuselage which gave the pilot excellent downward visibility. The first production machine, the S.V.A.4, which was first tested in spring of 1917, was found to be very fast but not manoeuvrable enough for the fighter role and as a result they were all allocated to reconnaissance units. From early 1918, the S.V.A.5 Primo arrived which was classed as the definitive production version. The S.V.A.5 could carry a 200lb bomb load and enough fuel to remain airborne for six hours; two hours longer than the S.V.A.4. The S.V.A.5 was also equipped with a camera for the photographic-reconnaissance role.

The Primos were immediately employed on long range flights against targets over the Alps, flying as far north as Friedrichshafen and Lake Constance. One famous operation took place on August 9, 1918 when eleven Primos of the 87 Squadriglia nicknamed the 'La Serenissima' made a 745-mile round trip from an airfield near San Pelagio to Vienna, where the formation spent 30 minutes dropping thousands of leaflets on the Austrian capital.

ANSALDO S.V.A.5 PRIMO TECHNICAL INFORMATION

FIRST FLIGHT: March 19, 1917

ENGINE: One 265hp S.P.A. 6a

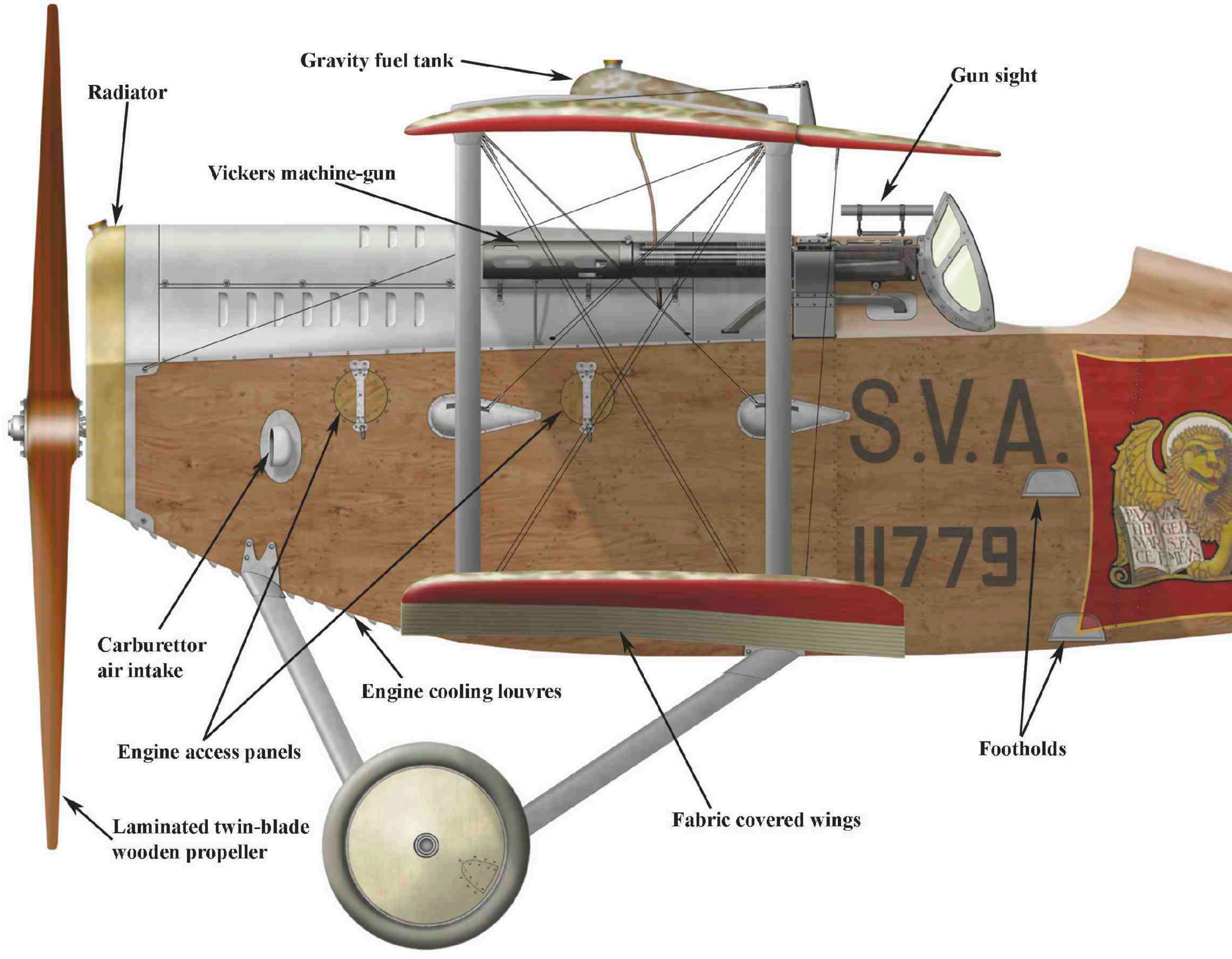
SPAN: 29ft 2.25in

LENGTH: 26ft 7in

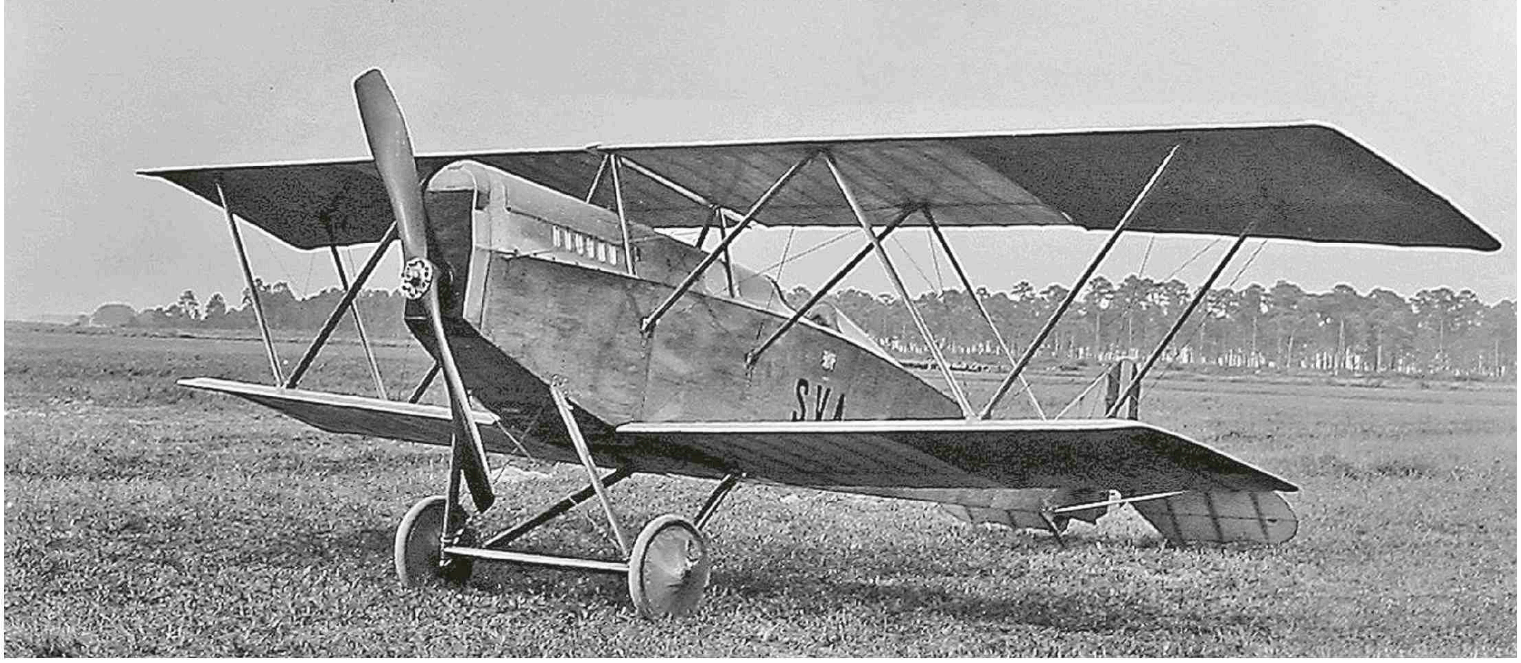
MAX SPEED: 140mph

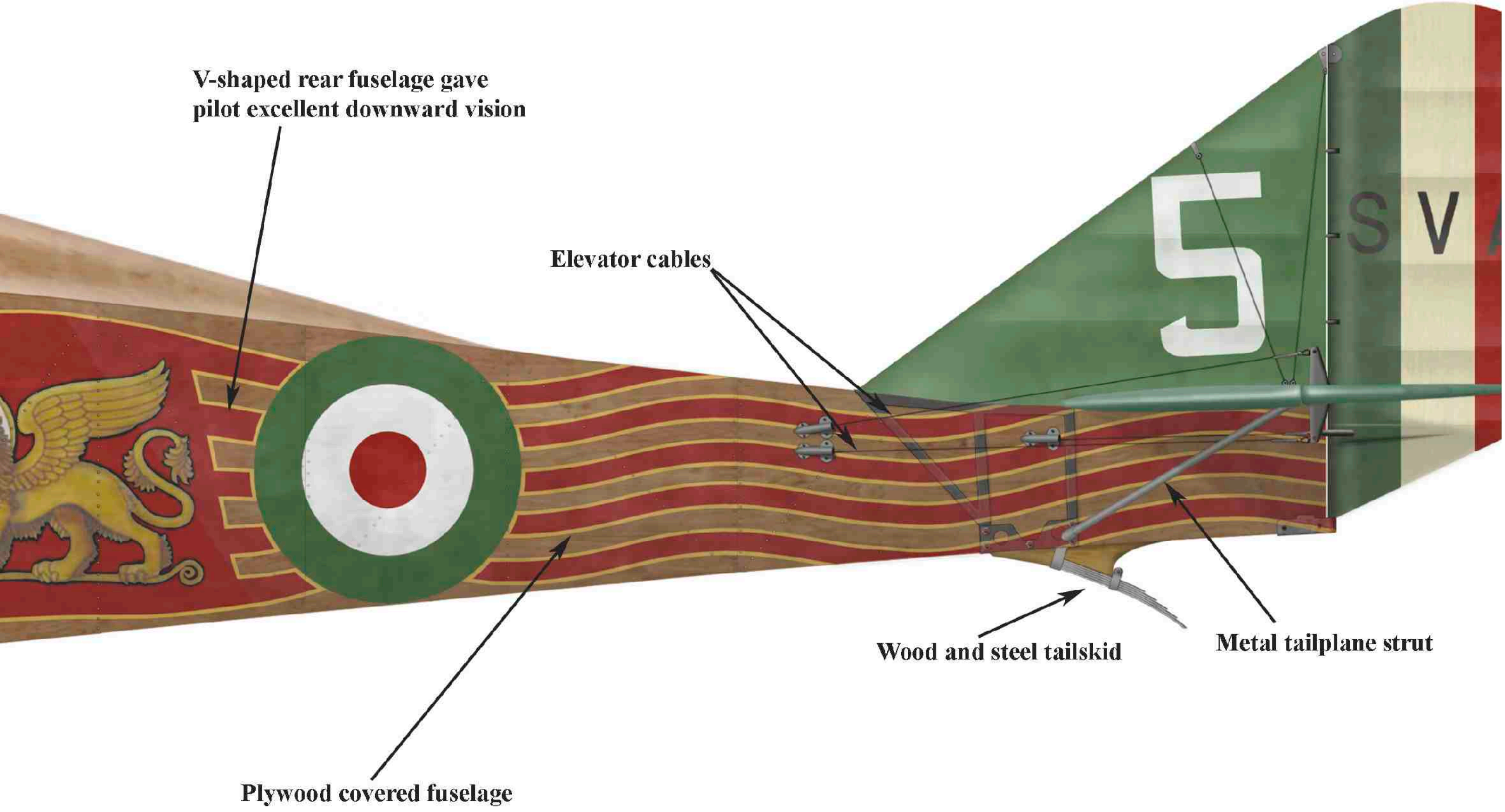
CREW: One

ARMAMENT: Two fixed forward-firing synchronised 0.303in (7.7mm) Vickers machine-guns and up to 200lb in bombs

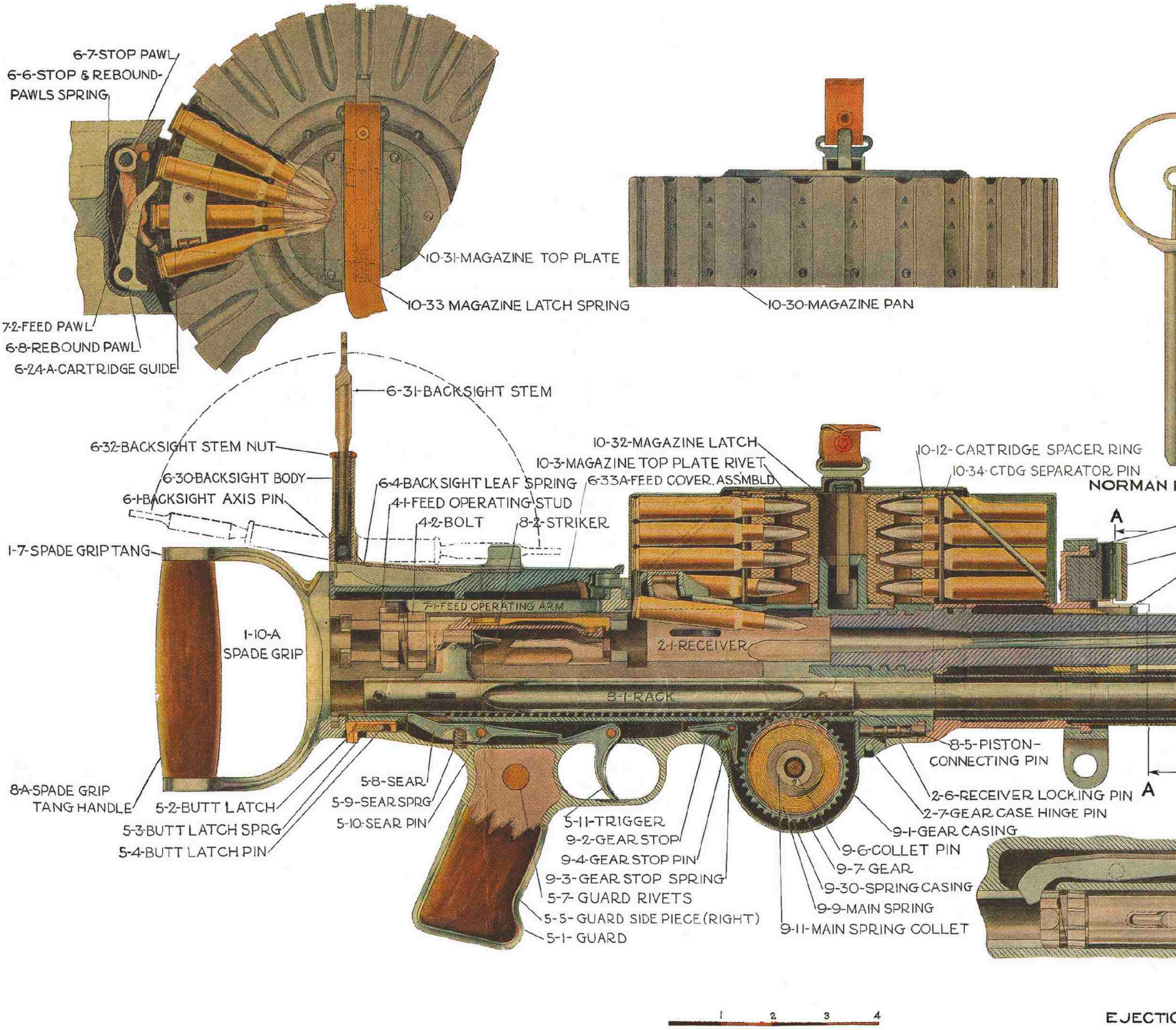


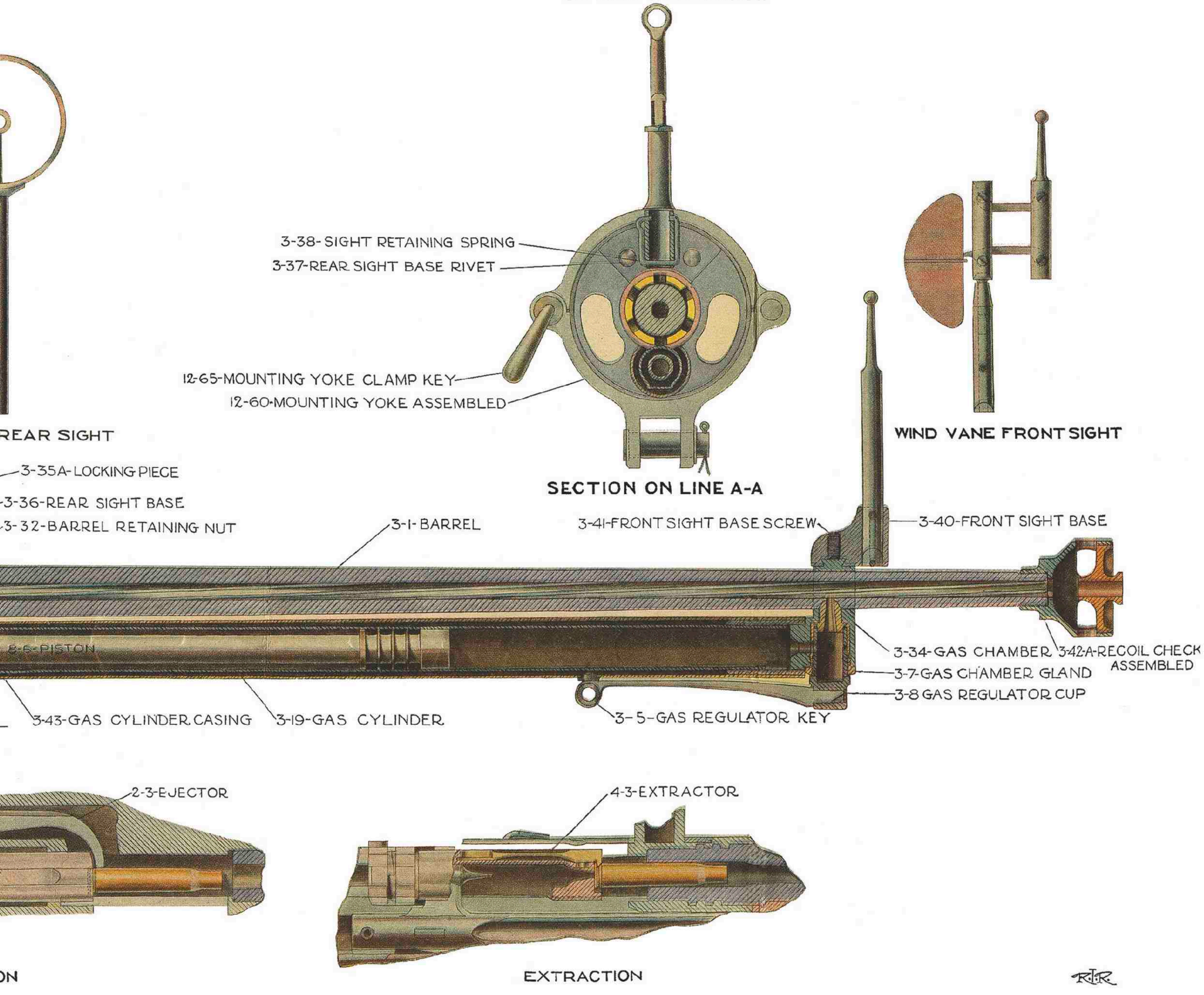
By far the most popular of the S.V.A. range for reconnaissance biplanes, the Primo remained in service long after the Regia Aeronautica was created in 1923 and several were involved in the Libyan campaign during the late 1920s.





With their distinctive Lion of St Mark painting along their fuselages, the 87 Squadriglia was one of the most famous S.V.A.5 Primo units thanks to its long-range operations including the leaflet raid to Vienna. This aircraft, 11779 was flown on the Vienna raid by Tenente Aldo Finzi.


6-7-STOP PAWL
6-6-STOP & REBOUND-PAWLS SPRING
10-31-MAGAZINE TOP PLATE
10-33 MAGAZINE LATCH SPRING
10-30-MAGAZINE PAN
7-2-FEED PAWL
6-8-REBOUND PAWL
6-24-A-CARTRIDGE GUIDE
6-31-BACKSIGHT STEM
6-32-BACKSIGHT STEM NUT
6-30-BACKSIGHT BODY
6-1-BACKSIGHT AXIS PIN
1-7-SPADE GRIP TANG
6-4-BACKSIGHT LEAF SPRING
4-1-FEED OPERATING STUD
4-2-BOLT
8-2-STRIKER
10-32-MAGAZINE LATCH
10-3-MAGAZINE TOP PLATE RIVET
6-33A-FEED COVER ASSMBLD
10-12-CARTRIDGE SPACER RING
10-34-CTDG SEPARATOR PIN
NORMAN
A
1-10-A SPADE GRIP
7-1-FEED OPERATING ARM
2-1-RECEIVER
8-1-RACK
8-5-PISTON-CONNECTING PIN
2-6-RECEIVER LOCKING PIN
A
2-7-GEAR CASE HINGE PIN
9-1-GEAR CASING
9-6-COLLET PIN
9-7-GEAR
9-30-SPRING CASING
9-9-MAIN SPRING
9-11-MAIN SPRING COLLET
8-A-SPADE GRIP TANG HANDLE
5-2-BUTT LATCH
5-3-BUTT LATCH SPRG
5-4-BUTT LATCH PIN
5-8-SEAR
5-9-SEAR SPRG
5-10-SEAR PIN
5-11-TRIGGER
9-2-GEAR STOP
9-4-GEAR STOP PIN
9-3-GEAR STOP SPRING
5-7-GUARD RIVETS
5-5-GUARD SIDE PIECE (RIGHT)
5-1-GUARD
1 2 3 4
EJECTI



LEWIS MACHINE GUN 30-U.S.GOV.

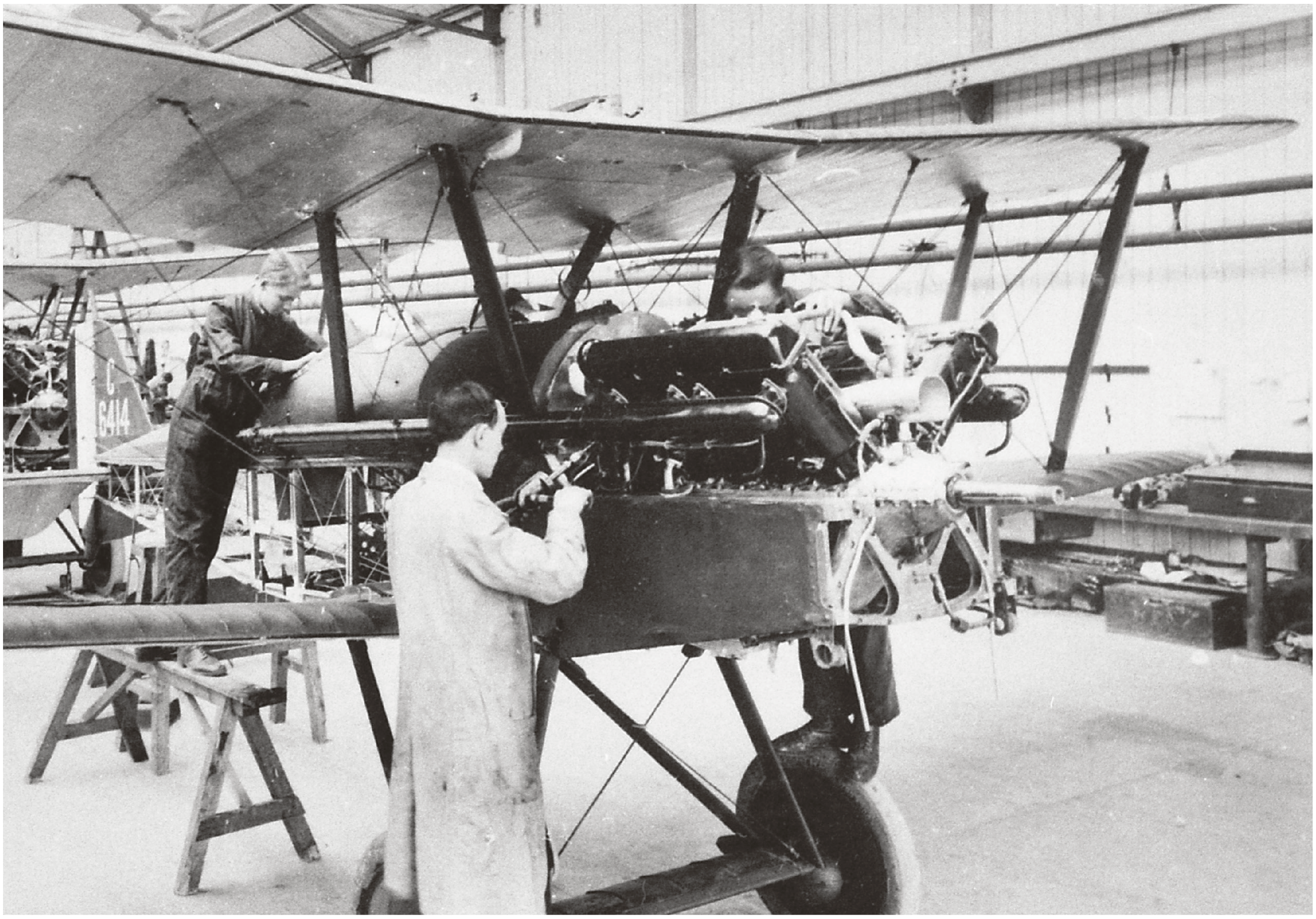
AIRPLANE

MODEL 1918

MFD. BY SAVAGE ARMS CORPORATION

UTICA N.Y. U.S.A.

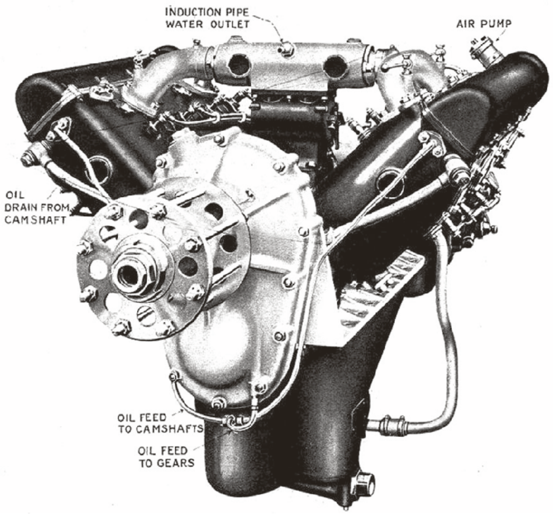
Rotary versus water-cooled inline



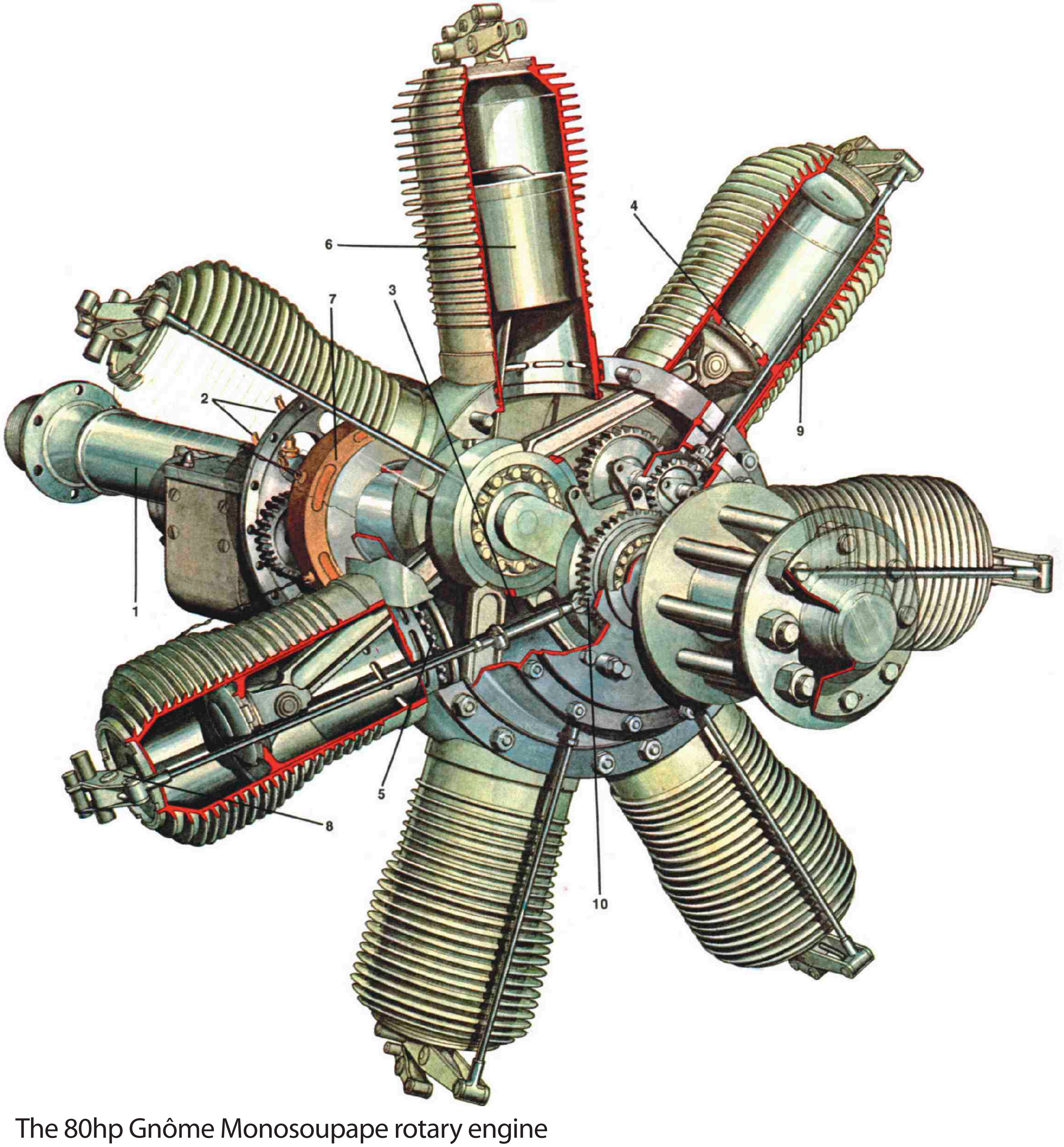
SE.5a C6414 reaches the final stages of production at the Wolseley Motors Ltd plant in Birmingham in 1918. Note the compact installation of the 200hp Hispano-Suiza water-cooled V8 (aka the Wolseley W.4 engine).

THERE WERE GENERALLY two types of powerplant fitted to aircraft during the First World War; these were the air-cooled rotary and the water-cooled inline or 'V'. Both had their advantages and disadvantages; the rotary in particular gave a good power-to-weight and size-to-power ratio and was easy to maintain. Another major advantage of the rotary was the gyroscopic effect the rotation would have on the entire aircraft which was later harnessed to improve manoeuvrability. On the down side, the rotary needed to be maintained within fine tolerances, habitually shed cylinders and was not fitted with a throttle; thrust was actually controlled by chopping the ignition to several cylinders at a time. High fuel consumption was another issue mainly because the rotary was always run at full speed.

The inline engine, often referred to as a stationary engine, evolved from the motor industry and is made up of a bank of cylinders contained within a block which drives a crankshaft. The cylinders could be a single bank or line or a twin bank of cylinders cantered from the crankshaft in a 'V' arrangement. Much heavier than a radial, the engine relies on fluid to keep it cool which involves pipes and a radiator. The latter in particular was one of the weaknesses of this type of engine and if holed by an enemy round, there was usually time to leave the fight as quickly as possible before the coolant ran out and the engine seized. The inline engine had potential for very high horsepower and thanks to their shape could be completely enclosed within the fuselage, allowing the aircraft to be designed more aerodynamically and as a result, fly faster. The small frontal area of the water-cooled engine also added to aerodynamic efficiency and a reliable throttle system via a carburettor gave the pilot considerably more control.



Not only did Wolseley Motors build large numbers of SE.5as, they also licenced-produced the Hispano-Suiza engine in six different versions; the Wolseley W.4A Viper, Python Mk I and II and the W.4.B Adder Mk I, II and III. This example is the W.4B.



The 80hp Gnôme Monosoupape rotary engine

The main design feature of the rotary was that the crankshaft was stationary; the cylinders rotated around it which turned a hub attached to the propeller.

The crankshaft of the rotary engine (1) was bolted to the structure of the aircraft. Three inlets (2) led into the crankshaft supplying air, fuel and the necessary castor oil lubricant to the engine from where all three are transferred to the crankcase (3), where the air and fuel combined and are vaporised. This mixture then enters the cylinder via apertures in the piston and at the base of the cylinder (4 & 5) which occurs when the piston (6) is at the bottom of the stroke. As the piston rises the mixture is compressed and then detonated by the spark plug, which is fired by the engine's magneto (7) when the cylinder reaches the correct point. The engine is then forced to rotate which in turn clears the chamber through the outlet valve (8), that is opened by a pushrod (9), operated by a cam (10).

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